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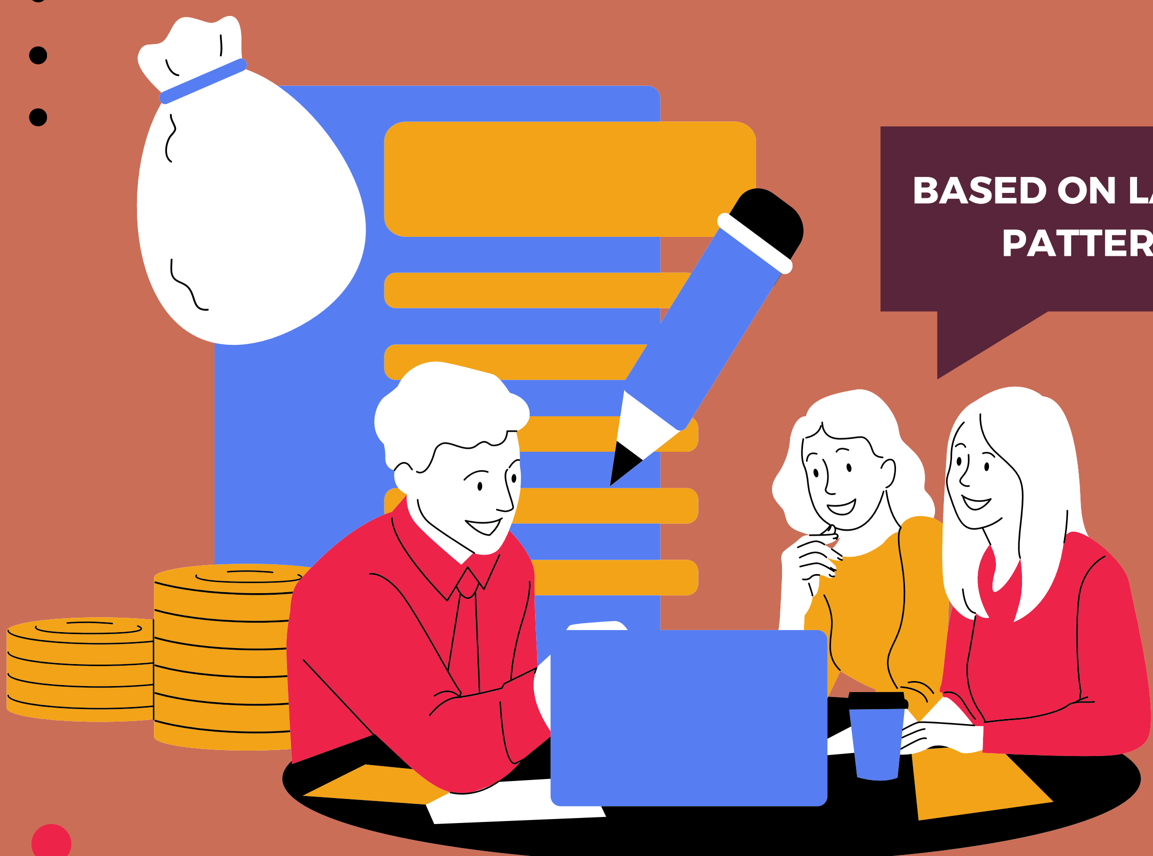
NO. 1 EDUCATIONAL RESOURCES

CUET 2024

MATHEMATICS

Sample Paper 1



BASED ON LATEST PATTERN

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CUET PRATICE PAPER 01

1. What is the order and degree of $3\left(\frac{d^3y}{dx^3}\right)^3 + 4\left(\frac{d^2y}{dx^2}\right)^4 - 7\left(\frac{dy}{dx}\right)^5 = 2x^2$?
   a) 4 and 3
   b) 1 and 5
   c) 4 and 2
   d) 3 and 3
2. Form the differential equation of the following equation $y = e^{4x}(a + bx)$.
   a) $y'' - 8y' - 16y = 0$
   b) $y'' - 8y' + 16y = 0$
   c) $y'' + 4y' + 16y = 0$
   d) $y'' - 4y' + 16y = 0$
3. What is $\int \frac{dx}{x(x^7+1)}$ equal to?
   a) $\frac{1}{2} ln\left|\frac{x^7-1}{x^7+1}\right| + c$
   b) $\frac{1}{7} ln\left|\frac{x^7+1}{x^7}\right| + c$
   c) $ln\left|\frac{x^7-1}{7x}\right| + c$
   d) $\frac{1}{7} ln\left|\frac{x^7}{x^7+1}\right| + c$
4. The function $f(x) = x^3 - 3x^2 + 6$ is an increasing function for
   a) $0 < x < 2$
   b) $x < 2$
   c) $x > 2 \; or \; x < 0$
   d) $all \; x$

5. Find the area bounded by the curve $y = x^2 + x + 4$, the x-axis and the ordinates $x = 1$ and $x = 3$.

   a) 61/3 units
   b) 46 units
   c) 62/3 units
   d) 65/3 units

6. If $A = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$, then $A^n =$

   a) $\begin{bmatrix} 1 & na \\ 0 & 1 \end{bmatrix}$
   b) $\begin{bmatrix} n & n \\ 0 & n \end{bmatrix}$
   c) $\begin{bmatrix} n & 1 \\ 0 & n \end{bmatrix}$
   d) $\begin{bmatrix} 1 & 1 \\ 0 & n \end{bmatrix}$

7. If $y = \frac{logx}{x}$, then $\frac{d^2y}{dx^2}$ is

   a) $\frac{-3+2\log x}{x^3}$
   b) $\frac{-3-2\log x}{x^3}$
   c) $\frac{-3+2\log x}{x}$
   d) $\frac{-3+2logx}{x^2}$

8. If $y = \sin^{-1} x$, then $(1 - x^2)y_2$ is equal to

   a) xy_1
   b) xy
   c) xy_2
   d) x^2

9. For the following probability distribution:

X	-4	-3	-2	-1	0
P(X)	0.1	0.2	0.3	0.2	0.2

E(X) is equal to

a) 0
b) -1
c) -2
d) -1.8

10. The probability that a person is not a swimmer is 0.3. The probability that out of 5 persons 4 are swimmers is

a) ${}^5C_4(0.7)^4(0.3)$
b) ${}^5C_1(0.7)(0.3)^4$
c) ${}^5C_4(0.7)(0.3)^4$
d) $(0.7)^4(0.3)$

11. The point at which the tangent to the curve $y = 2x^2 - x + 1$ is parallel to $y = 3x + 9$ will be

a) (2,1)
b) (1,2)
c) (3,9)
d) (-2,1)

12. If $y = 3t^2 - 4t - 3$ and $x = 8t + 5$, find $\frac{dy}{dx}$ at $t = 6$

a) 4
b) 3
c) 2
d) 1

13. Corner points of the feasible region for an LPP are (0,2), (3,0), (6,0), (6,8) and(0,5). Let $F = 4x + 6y$ be the objective function. Maximum of F – Minimum of F=

a) 60

b) 48

c) 42

d) 18

14. The value of the determinant $\begin{vmatrix} x & x+y & x+2y \\ x+2y & x & x+y \\ x+y & x+2y & x \end{vmatrix}$ is

a) $9x^2(x+y)$

b) $9y^2(x+y)$

c) $3y^2(x+y)$

d) $7x^2(x+y)$

15. There are two values of a which makes determinant, $\Delta = \begin{vmatrix} 1 & -2 & 5 \\ 2 & a & -1 \\ 0 & 4 & 2a \end{vmatrix} = 86$, then sum of these number is

a) 4

b) 5

c) -4

d) 9

16. If matrix $A = \begin{pmatrix} a & b & -5 \\ c & d & 0 \\ 5 & 0 & 0 \end{pmatrix}$ is skew symmetric, then value of $2a + b + c - 3d$ is

a) 1

b) -1

c) 0

d) 2

17. If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, then value of x is

    a) 3

    b) ± 3

    c) ± 6

    d) 6

18. Find the value of |adj(adj A)| if matrix A is of the order of 3 and |A|=15

    a) 3375

    b) 225

    c) 50625

    d) 625

19. The maximum value of $\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1+\cos\theta & 1 & 1 \end{vmatrix}$ is

    a) $\frac{1}{2}$

    b) $\frac{\sqrt{3}}{2}$

    c) $\sqrt{2}$

    d) $\frac{2\sqrt{3}}{4}$

20. Find $|\vec{x}|$ if $(\vec{x} - \vec{a}).(\vec{x} + \vec{a}) = 12$ and $\vec{a}$ is a unit vector?

    a) $2\sqrt{3}$

    b) $\sqrt{13}$

    c) 3

    d) None of these

21. Let A={1,2,3} and consider the relation R={{1,1),(2,2),(3,3),(1,2),(2,3),(1,3)}. Then R is

    a) reflexive but not symmetric

    b) reflexive but not transitive

    c) symmetric and transitive

    d) neither symmetric, nor transitive

22. Let T be the set of all triangles in a plane and R is a relation on T defined as $R = \{(T_1, T_2): T_1$ is similar to T_2 where $T_1, T_2 \in T\}$ then relation R is a?

a) Only reflexive

b) Only symmetric

c) Only transitive

d) Equivalence relation

23. Let $f: R - \{\frac{3}{5}\} \to R$ be defined by $f(x) = \frac{3x+2}{5x-3}$ Then

a) $f^{-1}(x) = f(x)$

b) $f^{-1}(x) = -f(x)$

c) $(fof)x = -x$

d) $f^{-1}(x) = \frac{1}{19}f(x)$

24. Let N be the set of natural numbers and $f: N \to N$ be a function given by $f(x) = x + 1$ for $x \in N$. Which one of the following is correct?

a) f is one-one and onto

b) f is one-one but not onto

c) f is only onto

d) f is neither one-one nor onto

25. The domain of the function defined by $f(x) = \sin^{-1}\sqrt{x-1}$ is

a) [1,2]

b) [-1,1]

c) [0,1]

d) None of these

26. If $|x| \le 1$, then $2\tan^{-1}x + \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ is equal to

a) $4\tan^{-1}x$

b) 0

c) $\frac{\pi}{2}$

d) π

27. Find the distance of the point (2,1,0) from the plane 2x+y+2z+5=0?

a) 10/7

b) 10

c) 10/3

d) None of these

28. Find the angle between the lines whose direction ratios (2,3,6) and (1,2,2)?

a) $\cos^{-1}\left(\frac{20}{21}\right)$

b) $\cos^{-1}\left(\frac{19}{21}\right)$

c) $\cos^{-1}\left(\frac{17}{21}\right)$

d) None of these

29. The integrating factor of the differential equation $\frac{dy}{dx} + y = \frac{1+y}{x}$ is:

a) $\frac{x}{e^x}$

b) $\frac{e^x}{x}$

c) xe^x

d) e^x

30. A relation R in set A={1,2,3} is defined as R={(1,1),(1,2),(2,2),(3,3)}. Which of the following ordered pair in R shall be removed to make it an equivalence relation in A?

a) (1,1)

b) (1,2)

c) (2,2)

d) (3,3)

31. The value of c in Rolle's theorem for the function $f(x) = x^3 - 3x$ in the interval $[0, \sqrt{3}]$ is

a) 1

b) -1

c) 3/2

d) 1/3

32. The sides of an equilateral triangle are increasing at the rate of 2cm/sec. The rate at which the area increases, when side is 10cm is:

a) $10\ cm^2/s$

b) $\sqrt{3}cm^2/s$

c) $10\sqrt{3}cm^2/s$

d) $\frac{10}{3}cm^2/s$

33. Evaluate: $\int \frac{x+1}{x^2-3x+2}dx$

a) $-2\log|x-1|+3\log|x-2|+c$

b) $2\log|x-1|+3\log|x-2|+c$

c) $-2\log|x-1|+3\log|x+2|+c$

d) $-2\log|x+1|+3\log|x-2|+c$

34. Find the value of a+b if

$\int_0^1 \frac{dt}{t^2+25} = \frac{1}{5}(\tan^{-1} b - \tan^{-1} a)$

a) 1

b) 1/2

c) 1/5

d) 1/6

35. The solution of $\frac{dy}{dx}+y=e^{-x}, y(0)=0$ is:

a) $y=e^x(x-1)$

b) $y=xe^{-x}$

c) $y=xe^{-x}+1$

d) $y=(x+1)e^{-x}$

36. The value of $\int_2^3 \frac{\sqrt{x}}{\sqrt{5-x}+\sqrt{x}}dx$ is

a) 1

b) 0

c) -1

d) 1/2

37. If $|\vec{a}| = 10$, $|\vec{b}| = 2$ and $\vec{a}.\vec{b} = 12$, then value of $|\vec{a} \times \vec{b}|$ is

a) 5

b) 10

c) 14

d) 16

38. Corner points of the feasible region determined by the system of linear constraints are (0,3), (1,1), and (3,0). Let Z=px+qy, where p,q>0. Condition on p and q so that the minimum of Z occurs at (3,0) and (1,1) is

a) $p = 2q$

b) $p = \frac{q}{2}$

c) $p = 3q$

d) $p = q$

39. If $P(A) = \frac{4}{5}$, and $P(A \cap B) = \frac{7}{10}$, then $P(B|A)$ is equal to

a) $\frac{1}{10}$

b) $\frac{1}{8}$

c) $\frac{7}{8}$

d) $\frac{17}{20}$

40. A die is thrown and a card is selected at random from a deck of 52 playing cards. The probability of getting an even number on the die and a spade card is

a) $\frac{1}{2}$

b) $\frac{1}{4}$

c) $\frac{1}{8}$

d) $\frac{3}{4}$

41. The mean and probability of success of a binomial distribution are 4 and 0.4 respectively. What is the variance?

a) 0.8
b) 2.4
c) 4.0
d) 5.2

42. The points on the curve $y^3 + 3x^2 = 12y$ where the tangent is vertical, is

a) $\left(\pm\frac{4}{\sqrt{3}}, -2\right)$
b) $\left(\pm\sqrt{\frac{11}{3}}, 0\right)$
c) (0,0)
d) $\left(\pm\frac{4}{\sqrt{3}}, 2\right)$

43. If A is a skew symmetric matrix, then A^2 is

a) Symmetric
b) Skew-symmetric
c) Diagonal
d) Scalar

44. In $\left(0, \frac{\pi}{2}\right)$, function $f(x) = \frac{x}{1+xtanx}$, have

a) One minimum point
b) One maximum point
c) No extreme point
d) Two maximum points

45. If $I_1 = \int_e^{e^2} \frac{dx}{\log x}$ and $I_2 = \int_1^2 \frac{e^x}{x} dx$ then

a) $I_1 - I_2 = 0$
b) $I_2 = 2I_1$
c) $I_1 = 2I_2$
d) $I_1 + I_2 = 0$

$P(x) = -5x^2 + 125x + 37500$ is the total profit of a company, where x is the production of the company. Answer Q-46 to Q-50 based on this statement.

46. What will be the production when the profit is maximum?
    a) 37500
    b) 12.5
    c) -12.5
    d) -37500
47. What will be the maximum profit?
    a) 38,28,125
    b) 38281.25
    c) 39000
    d) None
48. Check in which interval the profit is strictly increasing.
    a) $(12.5, \infty)$
    b) For all real numbers
    c) For all positive real numbers
    d) (0,12.5)
49. When the production is 2units what will be the profit of the company?
    a) 37500
    b) 37,730
    c) 37,770
    d) None
50. What will be the production of the company when the profit is Rs 38250?
    a) 15
    b) 30
    c) 2
    d) Data is not sufficient to find

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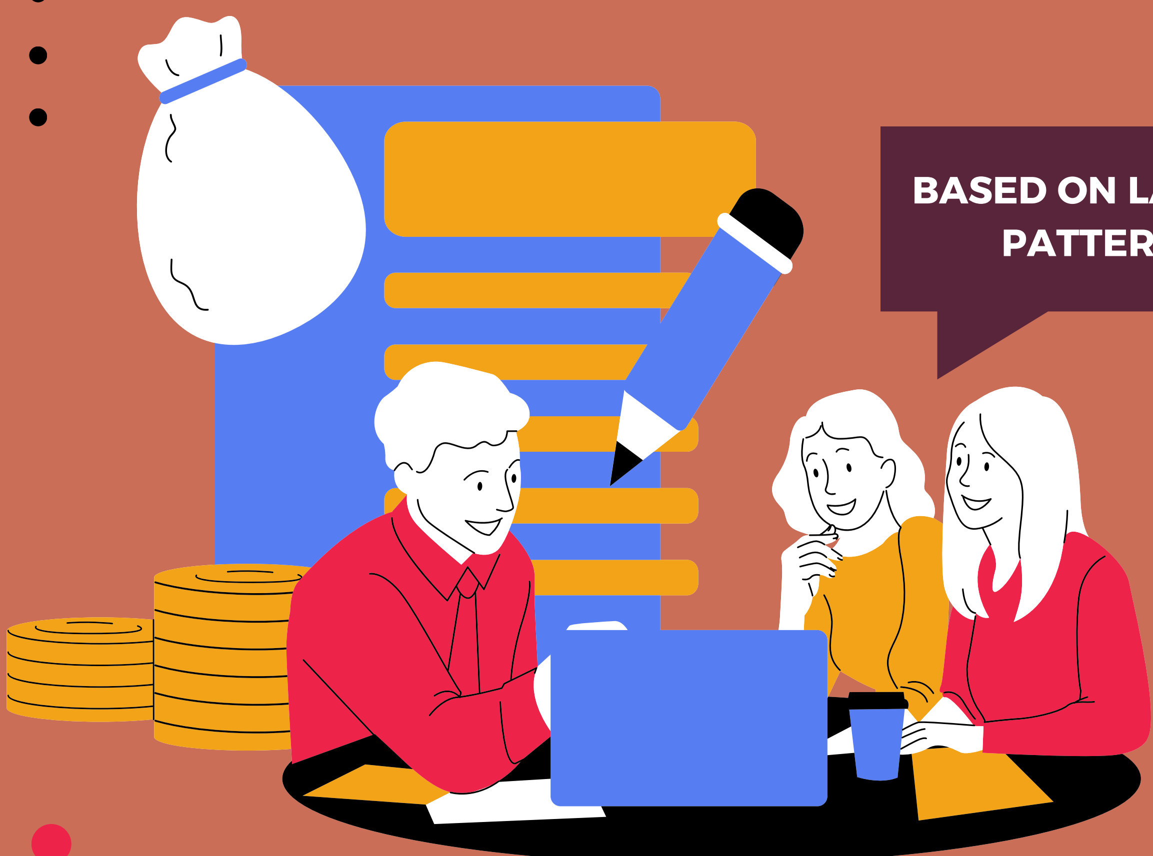
Sample Paper Solution 1



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HINTS AND SOLUTIONS

1. $3\left(\frac{d^3y}{dx^3}\right)^3+4\left(\frac{d^2y}{dx^2}\right)^4-7\left(\frac{dy}{dx}\right)^5=2x^2$

   So, from the given equation it is clear that the order is 3 as the highest derivative is 3.

   The degree is 3 as the power of the highest derivative is 3.

2. Given equation is $y=e^{4x}(a+bx)$

   There are 2 constants a and b so differentiate 2 times.

   $\Rightarrow y'=4ae^{4x}+be^{4x}+4bxe^{4x}\Rightarrow y'=4e^{4x}(a+bx)+be^{4x}$

   $\Rightarrow y'=4y+be^{4x}\Rightarrow be^{4x}=y'-4y$

   Differentiating one more time

   $\Rightarrow 4be^{4x}=y''-4y'\Rightarrow 4(y'-4y)=y''-4y'\Rightarrow y''-8y'+16y=0$

3. Let $I=\int\frac{dx}{x(x^7+1)}=\int\frac{dx}{x^8(1+\frac{1}{x^7})}$

   Let $1+\frac{1}{x^7}=t$

   Differentiating both sides, we get

   $\Rightarrow\left(0-\frac{7}{x^8}\right)dx=dt$

   $\therefore\frac{1}{x^8}dx=-\frac{dt}{7}$

   Now, $I=-\frac{1}{7}\int\frac{dt}{t}=-\frac{1}{7}\ln|t|+c$

   $\Rightarrow I=-\frac{1}{7}\ln\left|1+\frac{1}{x^7}\right|+c=-\frac{1}{7}\ln\left|\frac{x^7+1}{x^7}\right|+c$

   $I=\frac{1}{7}\ln\left|\frac{x^7}{x^7+1}\right|+c$

4. Given function is $f(x)=x^3-3x^2+6$

   A function is increasing when it's derivative is greater than zero. i.e $f'(x)>0$

   Differentiate equation, we get $\Rightarrow\frac{dy}{dx}=3x^2-6x$

   Since given function is increasing function.

   $\therefore f'(x)>0$

   $\Rightarrow 3x^2-6x>0\Rightarrow x(x-2)>0\Rightarrow x<0\ or\ x>2$

5. The area bounded by a curve is

$$A = \int_a^b f(x)dx$$

$$A = \int_1^3 (x^2 + x + 4)dx$$

$$A = \left[\frac{x^3}{3}\right]_1^3 + \left[\frac{x^2}{2}\right]_1^3 + 4[x]_1^3$$

$$A = \frac{26}{3} + \frac{8}{2} + 4(2)$$

$$A = \frac{62}{3} units$$

6. $A^2 = A.A = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$

$$= \begin{bmatrix} 1+0 & a+a \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 2a \\ 0 & 1 \end{bmatrix}$$

$$A^3 = A^2.A = \begin{bmatrix} 1 & 2a \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 2a+1a \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 3a \\ 0 & 1 \end{bmatrix}$$

Seeing the pattern here

$$A^n = \begin{bmatrix} 1 & na \\ 0 & 1 \end{bmatrix}$$

7. $y = \frac{logx}{x}$

Differentiating both sides with respect to x,

$$\Rightarrow \frac{dy}{dx} = \frac{x \times \frac{d(log\,x)}{dx} - \frac{dx}{dx}logx}{x^2}$$

$$\Rightarrow \frac{dy}{dx} = \frac{x\left(\frac{1}{x}\right) - logx}{x^2} = \frac{1 - logx}{x^2}$$

Differentiating again with respect to x,

$$\frac{d^2y}{dx^2} = \frac{x^2\left(\frac{d(1-logx)}{dx}\right) - (1-logx)\frac{d(x^2)}{dx}}{x^4}$$

$$\frac{d^2y}{dx^2} = \frac{x^2\left(-\frac{1}{x}\right) - (1-logx)(2x)}{x^4}$$

$$\frac{d^2y}{dx^2} = \frac{-3x + 2xlogx}{x^4}$$

$$\frac{d^2y}{dx^2} = \frac{-3 + 2logx}{x^3}$$

8. Given, $y = \sin^{-1} x$

   Differentiate on both sides, we get

   $y_1 = \frac{1}{\sqrt{1-x^2}}$

   Again, differentiate on both the sides, we get

   $y_2 = \frac{\left(\sqrt{1-x^2}\times\frac{d}{dx}(1)-1\times\frac{d}{dx}\left(\sqrt{1-x^2}\right)\right)}{\left(\sqrt{1-x^2}\right)^2}$

   $y_2 = \frac{\sqrt{1-x^2}\times 0-1\times\frac{-x}{\sqrt{1-x^2}}}{1-x^2}$

   $y_2 = \frac{\frac{x}{\sqrt{1-x^2}}}{1-x^2}$

   $(1-x^2)y_2 = \frac{x}{\sqrt{1-x^2}}$

   $(1-x^2)y_2 = y_1 x$

9. Expectation, $E(X) = (-4)\times 0.1 + (-3)\times 0.2 + (-2)\times 0.3 + (-1)\times 0.2 + 0$

   E(X)=-0.4-0.6-0.6-0.2

   E(X)=-1.8

10. The probability that a person is not a swimmer is 0.3.

    The probability that a person is a swimmer is 0.7

    P(X=4)= ${}^5C_4(0.7)^4(0.3)$

11. Let the required point be P(a,b)

    So, P(a,b) will satisfy the given curve "$y = 2x^2 - x + 1$"

    $\Rightarrow b = 2a^2 - a + 1$

    Differentiating with respect to x we get

    $\frac{dy}{dx} = 4x - 1$

    Slope of tangent = 4a-1

    But given the tangent is parallel to line $y = 3x + 9$. According to question

    $\Rightarrow 4a - 1 = 3$

    $\Rightarrow a = 1$

    $\Rightarrow b = 2$

12. $y = 3t^2 - 4t - 3$

Differentiating w.r.t t, we get

$\frac{dy}{dt} = 6t - 4$

Similarly,

$x = 8t + 5$

Differentiating w.r.t t

$\frac{dx}{dt} = 8$

$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$

$\frac{dy}{dx} = \frac{6t-4}{8}$

At t=6, we get

$\frac{dy}{dx} = 4$

13. Checking at corner points,

At (0,2) F=12,At (3,0) F=12,At(6,0) F=24,At (6,8) F=72,At (0,5) F=30

Maximum of F – Minimum of F = 72-12 = 60

14. $\Delta = \begin{vmatrix} x & x+y & x+2y \\ x+2y & x & x+y \\ x+y & x+2y & x \end{vmatrix}$

$R_1 \to R_1 - R_3, R_2 \to R_2 - R_3$

$\Delta = \begin{vmatrix} -y & -y & 2y \\ y & -2y & y \\ x+y & x+2y & x \end{vmatrix}$

$\Delta = y^2 \begin{vmatrix} -1 & -1 & 2 \\ 1 & -2 & 1 \\ x+y & x+2y & x \end{vmatrix}$

$R_1 \to R_1 + R_2$

$\Delta = y^2 \begin{vmatrix} 0 & -3 & 3 \\ 1 & -2 & 1 \\ x+y & x+2y & x \end{vmatrix}$

$\Delta = y^2[3(x - x - y) + 3(x + 2y + 2x + 2y)]$

$\Delta = y^2[-3y + 9x + 12y]$

$\Delta = y^2[9x + 9y] = 9y^2[x + y]$

15. $\Delta = \begin{vmatrix} 1 & -2 & 5 \\ 2 & a & -1 \\ 0 & 4 & 2a \end{vmatrix}$

$\Delta = 1(2a^2 + 4) + 2(4a) + 5(8)$

$\Delta = 2a^2 + 8a + 44 = 86$

$2a^2 + 8a - 42 = 0$

$a^2 + 7a - 3a - 21 = 0$

$(a + 7)(a - 3) = 0$

$a = -7,3$

Required sum = -4

16. Given: Matrix A is skew symmetric

So all elements that are present diagonally in a skew symmetric matrix are zero.

$a = d = 0$

$c = -b$

Now,

$2a + b + c - 3d = b + c = b + (-b) = 0$

17. $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$

$\Rightarrow 2x^2 - 40 = 18 + 14$

$\Rightarrow 2x^2 = 72$

$\Rightarrow x^2 = 36$

$\Rightarrow x = \sqrt{36}$

$\Rightarrow x = \pm 6$

18. |A|=15

$|adj(adjA)| = |A|^{(3-1)^2} = 15^4 = 50625$

19. $\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1+\cos\theta & 1 & 1 \end{vmatrix}$

$R_1 \to R_1 - R_2$

$\Delta = \begin{vmatrix} 0 & -\sin\theta & 0 \\ 1 & 1+\sin\theta & 1 \\ 1+\cos\theta & 1 & 1 \end{vmatrix}$

Expanding

$\Delta = 0 - (-\sin\theta)\,(1 - 1 - \cos\theta) + 0$

$\Delta = -\sin\theta\cos\theta = -\frac{1}{2}(2\sin\theta\cos\theta) = -\frac{1}{2}\sin 2\theta = \frac{1}{2}$

20. $(\vec{x} - \vec{a}).(\vec{x} + \vec{a}) = 12$

$(\vec{x} - \vec{a}).(\vec{x} + \vec{a}) = |\vec{x}|^2 - |\vec{a}|^2 = 12$

A is a unit vector

Hence, $|\vec{x}|^2 = 13 \Rightarrow |\vec{x}| = \sqrt{13}$

21. Given that, A={1,2,3} and R={(1,1),(2,2),(3,3),(1,2),(2,3),(1,3)}

Now, $(1,1), (2,2), (1,3) \in R$

R is reflexive

$(1,2), (2,3), (1,3) \in R\ but\ (2,1), (3,2), (3,1) \notin R$

R is not symmetric

Also, $(1,2) \in R$ and $(2,3) \in R \Rightarrow (1,3) \in R$

R is transitive

22. $R = \{(T_1, T_2){:}\, T_1$ is similar to T_2 where $T_1, T_2 \in T\}$ and T is the set of all triangles in a plane

As we know that, every triangle is similar to itself, so $(T_1, T_1) \in R\ \forall T_1 \in T$

R is reflexive

Suppose if $(T_1, T_2) \in R \Rightarrow T_1\ is\ similar\ to\ T_2$

$T_2\ is\ similar\ to\ T_1 \Rightarrow (T_2, T_1) \in R$

R is symmetric

Now, suppose $(T_1, T_2), (T_2, T_3) \in R$

So, $(T_1, T_3) \in R$

R is transitive

23. We have $f(x) = \frac{3x+2}{5x-3} = y$

$\Rightarrow 3x + 2 = y(5x - 3)$

$\Rightarrow 3x - 5xy = -3y - 2$

$\Rightarrow x(3 - 5y) = -3y - 2$

$\Rightarrow x = \frac{3y+2}{(5y-3)}$

$f^{-1}(x) = \frac{3x+2}{5x-3}$

$f^{-1}(x) = f(x)$

24. $f: N \to N$ be a function given by $f(x) = x + 1$

Let $x_1, x_2 \in N$

Now, $f(x_1) = f(x_2)$

$\Rightarrow x_1 + 1 = x_2 + 1$

$\Rightarrow x_1 = x_2$

Given function is one one

But not onto.

25. $f(x) = \sin^{-1}\sqrt{x-1}$

We know that $\sin^{-1}x$ is defined for $x \in [-1,1]$

$f(x) = \sin^{-1}\sqrt{x-1}$ is defined for

$\Rightarrow 0 \leq \sqrt{x-1} \leq 1$

$\Rightarrow 0 \leq x - 1 \leq 1$

$\Rightarrow 1 \leq x \leq 2$

$x \in [1,2]$

26. $2\tan^{-1}x + \sin^{-1}\left(\frac{2x}{1+x^2}\right)$

Let $\tan\theta = x \Rightarrow \theta = \tan^{-1}x$

$2\theta + \sin^{-1}\left(\frac{2\tan\theta}{1+tan^2\theta}\right)$

$= 2\theta + \sin^{-1}(\sin 2\theta)$

$= 2\theta + 2\theta$

$= 4\tan^{-1}x$

27. Distance of the given point from the given plane = $\left|\frac{2\times2+1\times1+2\times0+5}{\sqrt{2^2+1^2+2^2}}\right| = \left|\frac{10}{\sqrt{9}}\right|$

So, the distance between the plane and the point is 10/3 units.

28. Given: The direction ratios of two lines are (2,3,6) and (1,2,2)

As we know that the angle between the lines with direction ration is given by

$\cos\theta = \frac{2\times1+3\times2+6\times2}{\sqrt{2^2+3^2+6^2}\times\sqrt{1^2+2^2+2^2}} = \frac{20}{21}$

$\Rightarrow \theta = \cos^{-1}\left(\frac{20}{21}\right)$

29. Given $\frac{dy}{dx} + y = \frac{1+y}{x}$

$\Rightarrow \frac{dy}{dx} + y - \frac{y}{x} = \frac{1}{x}$

$\Rightarrow \frac{dy}{dx} + \left(1 - \frac{1}{x}\right) y = \frac{1}{x}$

This is a differential equation of the form

$\frac{dy}{dx} + P(x)y = Q(x)$

Here $P(x) = 1 - \frac{1}{x}$

Integrating factor = $e^{\int P(x)dx} = e^{\int\left(1-\frac{1}{x}\right)dx}$

$= e^{x-logx}$

I.F. = $\frac{e^x}{e^{logx}} = \frac{e^x}{x}$

30. Given, R={(1,1),(1,2),(2,2),(3,3)}

$(1,2) \in R\ but\ (2,1) \notin R$

Therefore, if we remove the pair (1,2). Then the relation R will be symmetric, reflexive, and transitive.

31. Given: $f(x) = x^3 - 3x$

$f'(x) = 3x^2 - 3$

$f'(c) = 3c^2 - 3 = 0$

$\Rightarrow 3c^2 = 3$

$\Rightarrow c^2 = 1$

$\Rightarrow c = \pm 1$

$\therefore c = 1 \in (0, \sqrt{3})$

32. Let the side length of the equilateral triangle be a. Given the rate of increase of side is 2cm/sec.$\Rightarrow \frac{da}{dt} = 2$

Area of an equilateral triangle (A)= $\frac{\sqrt{3}}{4}a^2$

$\Rightarrow \frac{dA}{dt} = \frac{\sqrt{3}}{4} \times \frac{d(a^2)}{dt} \Rightarrow \frac{dA}{dt} = \frac{\sqrt{3}}{4} \times 2a\frac{da}{dt}$

Given the length of side a = 10cm and da/dt=2

$\Rightarrow \frac{dA}{dt} = \frac{\sqrt{3}}{4} \times 2 \times 10 \times 2 \Rightarrow \frac{dA}{dt} = 10\sqrt{3}$

33. To solve: $\int \frac{x+1}{x^2-3x+2}dx$

The integrand is a proper rational fraction. So, by using the form of partial fraction, we write

$\Rightarrow \frac{x+1}{x^2-3x+2} = \frac{A}{x-1} + \frac{B}{x-2} \Rightarrow x + 1 = (A + B)x - 2A - B$

$\Rightarrow A + B = 1 \; and \; 2A + B = -1$

By solving these equations we get A=-2 and B=3

$\Rightarrow \frac{x+1}{x^2-3x+2} = \frac{-2}{x-1} + \frac{3}{x-2} \Rightarrow \int \frac{x+1}{x^2-3x+2}dx = \int \frac{-2}{x-1}dx + \int \frac{3}{x-2}dx$

$\Rightarrow \int \frac{x+1}{x^2-3x+2}dx = -2$log|x-1|+3log|x-2|+C

34. Using the formula, $\int_0^1 \frac{dt}{t^2+25} = \int_0^1 \frac{dt}{x^2+5^2}$

$= \frac{1}{5}\left(\tan^{-1}\frac{1}{5} - \tan^{-1}\frac{0}{5}\right)$

On comparing with question, a=0, b=1/5

a+b = 1/5

35. I.F. = $e^{\int 1\,dx} = e^x$

The solution of the differential equation is given by: $y \times I.F = \int (I.F)Q(x)dx + C$

$\Rightarrow y.e^x = \int e^x.e^{-x}\,dx$

$\Rightarrow y.e^x = \int dx \Rightarrow y.e^x = x + C$

Given y(0)=0

0=0+C

C=0$\Rightarrow y.e^x = x \Rightarrow y = xe^{-x}$

36. Given, $I = \int_2^3 \frac{\sqrt{x}}{\sqrt{5-x}+\sqrt{x}}dx$

By using property,$I = \int_2^3 \frac{\sqrt{5-x}}{\sqrt{5-x}+\sqrt{x}}dx$

Adding, $2I = \int_2^3 \frac{\sqrt{x}}{\sqrt{5-x}+\sqrt{x}}dx + \int_2^3 \frac{\sqrt{5-x}}{\sqrt{5-x}+\sqrt{x}}dx$

$\Rightarrow 2I = \int_2^3 \frac{\sqrt{5-x}+\sqrt{x}}{\sqrt{5-x}+\sqrt{x}}dx \Rightarrow 2I = \int_2^3 dx \Rightarrow 2I = 1 \Rightarrow I = \frac{1}{2}$

37. Given $|\vec{a}| = 10$, $|\vec{b}| = 2$ and $\vec{a}.\vec{b} = 12$

We know $\vec{a}.\vec{b} = |\vec{a}||\vec{b}|\cos\theta$

$\Rightarrow 12 = 10 \times 2\cos\theta \Rightarrow \cos\theta = \frac{3}{5} \Rightarrow \sin\theta = \sqrt{1-cos^2\theta} = \sqrt{1-\left(\frac{3}{5}\right)^2}$

$\sin\theta = \frac{4}{5}$

$|\vec{a}\times\vec{b}| = 16$

38. Z=px+qy, where p,q>0

Corner points of the feasible region determined by the system of linear constraints are (0,3),(1,1) and(3,0)

Let z be the minimum value of z in feasible region.

Since the minimum occurs at both (3,0) and (1,1).

z=p.3+q.0

z=p.1+q.1

3p=p+q

p=q/2

39. $P(A) = \frac{4}{5}$, and $P(A \cap B) = \frac{7}{10}$

$P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{7}{8}$

40. Let E1 be the event of getting an even number on the die.

P(E1)=1/2

Let E2 be the event of getting a spade on a card.

P(E2)=1/4

Since both events are independent, we can write $P(E1 \cap E2) = P(E1).P(E2) = \frac{1}{2}.\frac{1}{4} = \frac{1}{8}$

41. p=0.4

np=4

⇒n=10

⇒p=1-q

⇒q=1-0.4=0.6

Variance=10(0.4)(0.6)=2.4

42. $y^3 + 3x^2 = 12y$

$\Rightarrow 3y^2.\frac{dy}{dx} + 6x = 12.\frac{dy}{dx} \Rightarrow \frac{dy}{dx} = \frac{6x}{12-3y^2}$

$\Rightarrow \frac{dx}{dy} = \frac{12-3y^2}{6x}$

For vertical tangent dx/dy=0

$12 - 3y^2 = 0$

$y = \pm 2, x = \pm \frac{4}{\sqrt{3}}$

43. If A is a skew-symmetric matrix

$\Rightarrow A^T = -A \Rightarrow (A^2)^T = (A.A)^T = -A \times -A = A^2$

Hence symmetric.

44. $f(x) = \frac{x}{1+xtanx}$

On differentiating we get one extremum point.

Again differentiating we get that it has one maximum point.

45. $I_1 = \int_e^{e^2} \frac{dx}{\log x}$ and $I_2 = \int_1^2 \frac{e^x}{x} dx$

$I_1 = \int_e^{e^2} \frac{dx}{\log x}$ put logx=z

$I_1 = \int_1^2 (e^z\, dz)/z$

$I_1 = \int_1^2 (e^x\, /x) dz = I_2$

$I_1 - I_2 = 0$

46. $P(x) = -5x^2 + 125x + 37500$

$\frac{dp}{dx} = -10x + 125$

For maximum profit dp/dx=0

-10x+125=0

x=12.5

47. We have found that profit is maximum when production is 12.5.

P(12.5)=-5(12.5)(12.5)+125(12.5)+37500

P(12.5)=38281.25

48. For profit to strictly increase, $\frac{dp}{dx} > 0$

-10x+125>0

10x<125

x<12.5

Hence interval (0,12.5)

49. Put x=2

    P(2)=-5(2)(2)+125(2)+37500

    P(2)=37,730

50. P(x)=38250

    $38250 = -5x^2 + 125x + 37500$

    $5x^2 - 125x + 750 = 0$

    (x-10)(x-15)=0

    x=10 or x=15

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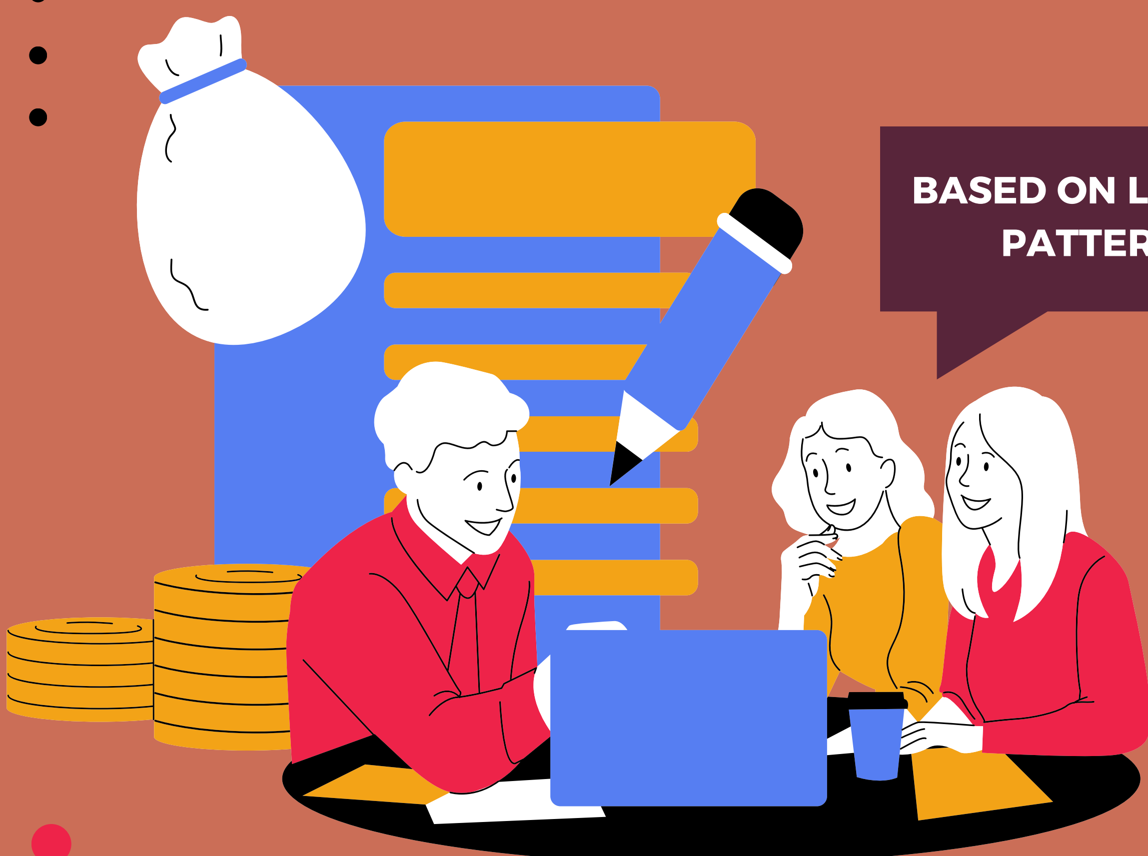
MATHEMATICS

Sample Paper 2



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CUET PRATICE PAPER 02

1. The order and degree of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^2\right] = \frac{d^2y}{dx^2}$ are:

   a) $2, \frac{3}{2}$

   b) 2,3

   c) 2,1

   d) 3,4

2. If $f(x) = ax^2 + 6x + 5$ attains its minimum value at x=1, then the value of a is

   a) 0

   b) 5

   c) 3

   d) -3

3. The tangent to the curve $y = ax^2 + bx$ at (2,-8) is parallel to x-axis. Then

   a) $a = 2, b = -2$

   b) $a = 2, b = -4$

   c) $a = 2, b = -8$

   d) $a = 4, b = -4$

4. The differential equation of the family of curves $y = Ae^{3x} + Be^{5x}$, where A and B are arbitrary constants, is

   a) $\frac{d^2y}{dx^2} + 8\frac{dy}{dx} + 15y = 0$

   b) $\frac{d^2y}{dx^2} - 8\frac{dy}{dx} + 15y = 0$

   c) $\frac{d^2y}{dx^2} - \frac{dy}{dx} + y = 0$

   d) None of these

5. If x is real then find the minimum value of (x+5)(x+7)
   a) 0
   b) -1
   c) 1
   d) 2
6. The equation of normal to the curve $3x^2 - y^2 = 8$ which is parallel to the line $x + 3y = 8$ is
   a) $3x - y = 8$
   b) $3x + y + 8 = 0$
   c) $x + 3y \pm 8 = 0$
   d) $x + 3y = 0$
7. The function $f(x) = x^2 - 4x, x \in [0,4]$ attains minimum value at
   a) $x = 0$
   b) $x = 1$
   c) $x = 2$
   d) $x = 4$
8. $\int \frac{3x^2+1}{x} dx$
   a) $2x^3 = 2\sqrt{x^2} + c$
   b) $x^3 + \sqrt{x^2} + c$
   c) $2x^3 \log x + c$
   d) $x^3 + logx + c$
9. The area under the curve $y = x^2$ between the lines $x = 2$ and $x = 3$ is:
   a) $\frac{19}{3}$
   b) $\frac{1}{9}$
   c) $\frac{9}{19}$
   d) $\frac{19}{8}$

10. The maximum value of $\left(\frac{1}{x}\right)^{x}$ is:

a) e

b) e^{e}

c) $e^{\frac{1}{e}}$

d) $\left(\frac{1}{e}\right)^{1/e}$

11. Evaluate $\int tan^{3}x sec^{2}\, x\, dx$

a) $sec^{2}x + c$

b) $\frac{tan^{4}x}{4} + c$

c) $\frac{tan^{4}x}{2} + c$

d) $2\tan x \sec x + c$

12. $\int \frac{x^{9}}{(4x^{2}+1)^{6}} dx$ is equal to

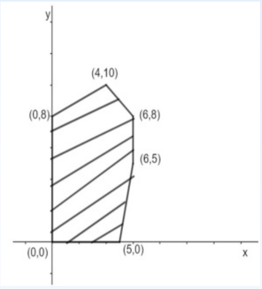
a) $\frac{1}{5x}\left(4 + \frac{1}{x^{2}}\right)^{-5} + c$

b) $\frac{1}{5}\left(4 + \frac{1}{x^{2}}\right)^{-5} + c$

c) $\frac{1}{10x}(1 + 4)^{-5} + c$

d) $\frac{1}{10}\left(4 + \frac{1}{x^{2}}\right)^{-5} + c$

13. The feasible solution for an LPP is shown in figure. Let Z = 3x-4y be the objective function. (Maximum value of Z +Minimum value of Z) is equal to:



a) 13

b) 1

c) -13

d) -17

14. Six coins are tossed simultaneously. What is the probability of getting exactly 2 head

a) $\frac{49}{64}$

b) $\frac{1}{64}$

c) $\frac{3}{8}$

d) $\frac{15}{64}$

15. If A is a square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to:

a) A

b) $I + A$

c) $I - A$

d) I

16. Which of the following is the principal value branch of $\csc^{-1} x$?

a) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

b) $[0, \pi] - \left\{\frac{\pi}{2}\right\}$

c) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

d) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right] - \{0\}$

17. x and y be two variables such that x>0 and xy=1, then the minimum value of (x+y) is

a) 2

b) 3

c) 4

d) 0

18. If the sum of the matrices $\begin{bmatrix} x \\ y \\ z \end{bmatrix}, \begin{bmatrix} y \\ y \\ z \end{bmatrix}$ and $\begin{bmatrix} z \\ 0 \\ 0 \end{bmatrix}$ is the matrix $\begin{bmatrix} 10 \\ 5 \\ 5 \end{bmatrix}$ then what is the value of y?

a) -5

b) 0

c) 5

d) 10

19. If f(x) is an invertible function, what is $f^{-1}(x)$ if $f(x) = \frac{3x-2}{5}$

a) $\frac{3x-2}{5}$

b) $\frac{3x+2}{5}$

c) $\frac{5x+2}{3}$

d) $\frac{5x-2}{3}$

20. The position vector of the point which divides the join of points with position vectors $\vec{a} + \vec{b}$ and $2\vec{a} - \vec{b}$ in the ratio 1:2 is

a) $\frac{3\vec{a}+2\vec{b}}{3}$

b) $\vec{a}$

c) $\frac{5\vec{a}-\vec{b}}{3}$

d) $\frac{4\vec{a}+\vec{b}}{3}$

21. Find the value of b if $\int \frac{dx}{\sqrt{9-x^2}} = \sin^{-1}\frac{x}{b} + C$

a) 2

b) 3

c) 4

d) 5

22. If A and B are square matrices of the same order and AB=3I, then A^{-1} is equal to

a) $3B$

b) $\frac{1}{3}B$

c) $3B^{-1}$

d) $\frac{1}{3}B^{-1}$

23. If the rolle's theorem holds for the function $f(x) = x^4 + ax^3 + bx$, in $-1 \leq x \leq 1$ and $f'\left(\frac{1}{2}\right) = 0$ then ab=

a) -4

b) -64

c) -1

d) -8

24. Evaluate $\int_0^1 \frac{e^{\sin^{-1} x}}{\sqrt{1-x^2}} dx$

a) $e - 1$

b) $e^{\frac{\pi}{2}} - 1$

c) $e^{\frac{\pi}{2}} - e$

d) $-e^{\frac{\pi}{2}} - 1$

25. The function $f: R \to R$ defined as $f(x) = x^3$ is:

a) One-one but not onto

b) Not one-one but onto

c) Neither one-one nor onto

d) One-one and onto

26. If a relation R on the set {1,2,3} be defined by R={(1,2)}, then R is

a) Reflexive

b) Transitive

c) Symmetric

d) None of these

27. Find the value of the $\int_{-\pi}^{\pi} \cos x \, dx$

a) 0

b) 1

c) -1

d) 2

28. If $x = t^2 - 1$ and $y = t^2 + 1$, then $\frac{dy}{dx} = ?$

a) $\frac{1}{2t}$

b) $2t$

c) $1 + \frac{1}{2t}$

d) None of these

29. If $\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{x}{3}\right) = \frac{\pi}{4}$, where $0 < x < 6$, then what is x equal to?

a) 1

b) 2

c) 3

d) 5

30. If $y = \log \log x$, then $e^y \frac{dy}{dx} =$

a) $\frac{1}{x \log x}$

b) $\frac{1}{x}$

c) $\frac{1}{logx}$

d) e^y

31. If $A = \begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}$ and $kA = \begin{bmatrix} 0 & 3a \\ 2b & 24 \end{bmatrix}$ then the values of k, a and b respectively are

a) -6,-12,-18

b) -6,-4,-9

c) -6,4,9

d) -6,12,18

32. Given that A is a non-singular matrix of order 3 such that $A^2 = 2A$, then value of $|2A|$ is

a) 4

b) 8

c) 64

d) 16

33. The domain of $\sin^{-1} 2x$ is

a) [0,1]

b) [-1,1]

c) $\left[-\frac{1}{2}, \frac{1}{2}\right]$

d) [-2,2]

34. The plane $2x - 3y + 6z - 11 = 0$ makes an angle $\sin^{-1}(\alpha)$ with x-axis. The value of α is equal to

a) $\frac{\sqrt{3}}{2}$

b) $\frac{\sqrt{3}}{3}$

c) $\frac{2}{7}$

d) $\frac{3}{7}$

35. Let $f(x) = \begin{cases} 3x - 4, 0 \leq x \leq 2 \\ 2x + l, \ 2 < x \leq 9 \end{cases}$. If f is continuous at x=2, then what is the value of l?

a) 0

b) 2

c) -2

d) -1

36. If $y = \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$, then find $\frac{dy}{dx}$

a) $\frac{1}{1+x^2}$

b) $\frac{2}{1+x^2}$

c) $\frac{2}{2+x^2}$

d) None of these

37. If $\tan^{-1} x + \tan^{-1} y = \frac{4\pi}{5}$, then $\cot^{-1} x + \cot^{-1} y$ equals

a) $\frac{\pi}{5}$

b) $\frac{2\pi}{5}$

c) $\frac{3\pi}{5}$

d) π

38. If $y = 2^x + x \log x$, then find $\frac{dy}{dx}$:

a) $2^x \log 2 - \log x - 1$

b) $2^x \log 2 + \log x + 1$

c) $2^x \log 2 - \log x + 1$

d) $2^x \log 2 + \log x - 1$

39. The area of a triangle with vertices A(3,0),B(7,0) and C(8,4) is:

a) 14

b) 8

c) 28

d) 6

40. Evaluate $\int \frac{dx}{x^2+4}$

a) $\frac{1}{4}\tan^{-1}\frac{x}{4} + C$

b) $\frac{1}{2}\tan^{-1}\frac{x}{2} + C$

c) $\tan^{-1}\frac{x}{4} + C$

d) $\tan^{-1}\frac{x}{2} + C$

41. If A and B are two independent events with $P(A) = \frac{3}{5}$ and $P(B) = \frac{4}{9}$, then $P(A' \cap B')$ equals

a) $\frac{4}{15}$

b) $\frac{8}{45}$

c) $\frac{1}{3}$

d) $\frac{2}{9}$

42. The radius of a circle is changing at the rate of $\frac{dr}{dt} = 0.01 m/sec$. The rate of change of its area $\frac{dA}{dt}$, when the radius of the circle is 4m, is

a) $16\pi \frac{m^2}{sec}$

b) $0.16\pi \frac{m^2}{sec}$

c) $0.08\pi \frac{m^2}{sec}$

d) $0.04\pi \frac{m^2}{sec}$

43. Find the value of the $\int_0^{\pi/2} \frac{\tan x}{\tan x + \cot x} dx$

a) $\frac{\pi}{4}$

b) $\frac{\pi}{7}$

c) $\frac{\pi}{2}$

d) $\frac{\pi}{8}$

44. Which of the following is not a homogeneous function of x and y.

a) $x^2 + 2xy$

b) $2x - y$

c) $cos^2 \left(\frac{y}{x}\right) + \frac{y}{x}$

d) $\sin x - \cos y$

45. Let $f: R \to R$ be the function defined by $f(x) = \frac{2x-1}{2}$ and $g: Q \to R$ be another function defined by g(x)=x+2. Then (gof)$\frac{3}{2}$ is

a) 1

b) – 1

c) 7/2

d) None of these

Direction: Based on the following information, answer the following questions:

Volume of the container given as the function of length is $V(x) = -x^2 + 25x + 7500$.

46. What will be the length (in m) when the volume is maximum?

a) 10

b) 11.5

c) 12.5

d) 9

47. What is the maximum volume of the container (in m^3)?

a) 7656.25

b) 7968.75

c) 7432.25

d) 7864.75

48. In which interval, the volume function is strictly increasing?

a) (7.5,13.5)

b) (12.5,∞)

c) (0,12.5)

d) None of these

49. What will be the volume of the container (in m^3) when the length is 4m?

a) 7744

b) 7832

c) 7256

d) 7584

50. What will be the length (in m) when the volume of the container is $7650m^3$?

a) 10

b) 11

c) 12

d) 13

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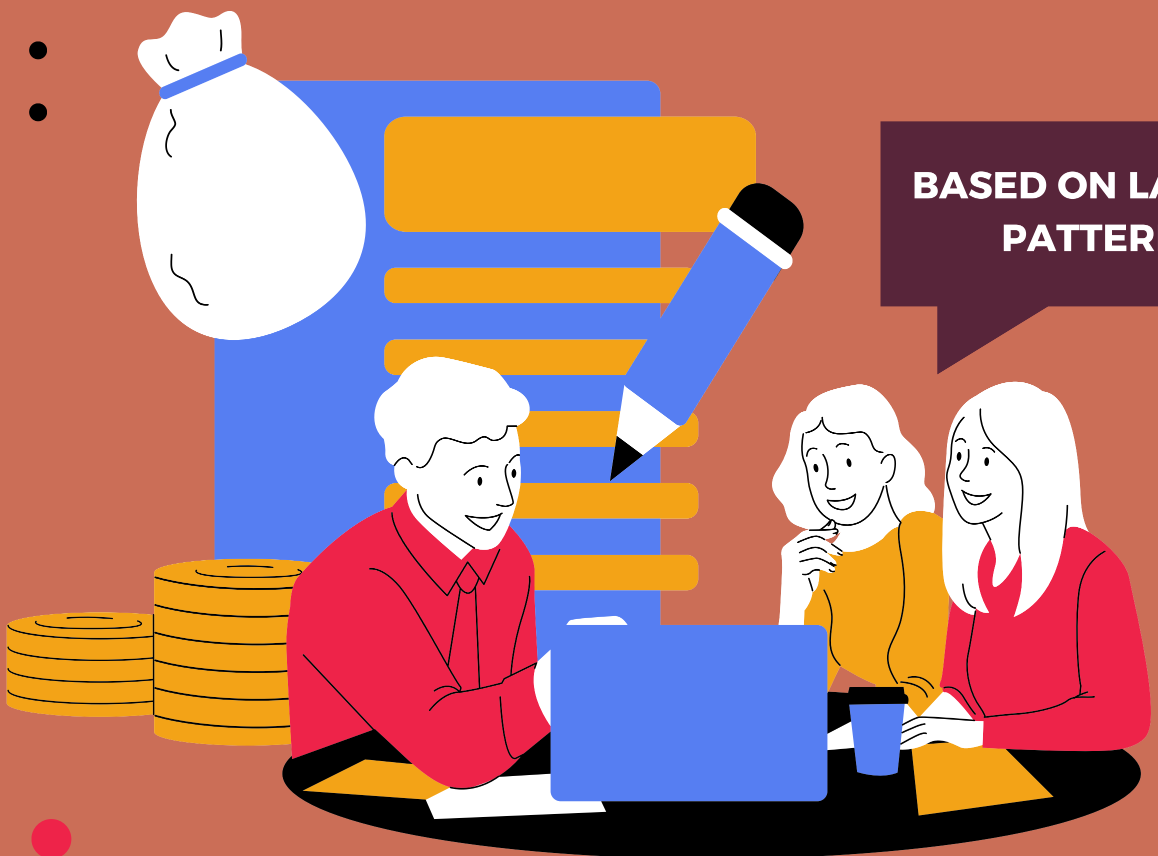
Sample Paper 3



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CUET PRATICE PAPER 03

1. Let A = {1, 2, 3} and let R = {(1,1), (2, 2), (3, 3), (1, 3), (3, 2), (1, 2)}. Then, R is
   a) Symmetric and transitive but not reflexive
   b) Reflexive and transitive but not symmetric
   c) Reflexive and symmetric but not transitive
   d) An equivalence relation
2. The relation R = {1, 1), (2, 2), (3, 3)} on the set {1, 2, 3) is
   a) An equivalence relation
   b) Reflexive relation only
   c) Symmetric relation only
   d) Transitive relation only
3. If $\sin^{-1}$ x = y, then
   a) $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$
   b) $-\frac{\pi}{2} < y < \frac{\pi}{2}$
   c) $0 \leq y \leq \pi$
   d) $0 < y < \pi$
4. $\tan^{-1}\frac{1}{7} + 2\tan^{-1}\frac{1}{3}$ is equal to
   a) None of these
   b) $\frac{\pi}{2}$
   c) $\frac{\pi}{4}$
   d) $\frac{3\pi}{4}$

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5. If A and B are any two matrices, then
   a) AB may or may not be defined.
   b) AB = O
   c) $A^2 = O$
   d) $2A^2$

6. The matrix $\begin{bmatrix} 0 & -5 & 8 \\ 5 & 0 & 12 \\ -8 & -12 & 0 \end{bmatrix}$ is a
   a) Symmetric matrix
   b) Scalar matric
   c) Diagonal matrix
   d) Skew-symmetric matrix

7. The matrix $A = \begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$ is
   a) Singular
   b) Nilpotent
   c) Orthogonal
   d) Idempotent

8. If a and discriminant of $ax^2 + 2bx + c$ is negative, then $\Delta = \begin{vmatrix} a & b & ax+b \\ b & c & bx+c \\ ax+b & bx+c & 0 \end{vmatrix}$ is
   a) 0
   b) $(ac - b^2)(ax^2 + 2bx + c)$
   c) Positive
   d) Negative

9. $\begin{vmatrix} 1 & 1 & 1 \\ e & 0 & \sqrt{2} \\ 2 & 2 & 2 \end{vmatrix}$ is equal to
   a) 0
   b) 3e
   c) None of these
   d) 2

10. $f(x)=\begin{cases}\frac{\sqrt{1+px}-\sqrt{1-px}}{x} & -1\leq x<0\\ \frac{2x+1}{x-2} & ,0\leq x\leq 1\end{cases}$ is continuous in the interval [- 1, 1], then p is equal to

a) 1

b) 1/2

c) -1/2

d) -1

11. If $x^p\, y^q = (x+y)^{(p+q)}$ then $\frac{dy}{dx}=?$

a) None of these

b) $\frac{y}{x}$

c) $\frac{x^{p-1}}{y^{q-1}}$

d) $\frac{x}{y}$

12. If $y = a + bx^2$, a, b arbitrary constants, then

a) $x\frac{d^2y}{dx^2}-\frac{dy}{dx}+y=0$

b) $x\frac{d^2y}{dx^2}=2xy$

c) $\frac{d^2y}{dx^2}=2xy$

d) $x\frac{d^2y}{dx^2}=y_1$

13. f(x) = sin x is increasing in

a) $\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$

b) $\left(\pi,\frac{3\pi}{2}\right)$

c) $(0,\pi)$

d) $\left(\frac{\pi}{2},\pi\right)$

14. The minimum value of $\frac{x}{\log x}, x > 1$, is

a) None of these

b) e

c) – e

d) $\frac{1}{e}$

15. $\int$ cosec xdx=?

a) log |cosec x + cot x| + C

b) None of these

c) - log |cosec x - cot x| + C

d) log |cosec x - cot x| + C

16. If x $=\int_0^y \frac{dt}{\sqrt{1+9t^2}}$ and $\frac{d^2y}{dx^2}$ = ay, then a is equal to

a) 9

b) 1

c) 6

d) 3

17. $\int \sqrt{1-\cos x}dx$ =?

a) $-2\sqrt{1+\ \cos x}+C$

b) $-\sqrt{2}\cos\frac{x}{2}+c$

c) $\frac{-1}{\sqrt{2}}\cos\frac{x}{2}+c$

d) $\frac{-1}{3}\cos\frac{x}{2}+C$

18. $\int x\sqrt{x^2-1}dx$ =?

a) $\frac{1}{3}(x^2-1)^{\frac{3}{2}}+C$

b) $\frac{2}{3}(x^2-1)^{\frac{3}{2}}+C$

c) $\frac{1}{\sqrt{x^2-1}}+C$

d) None of these

19. Given that: $\int_0^{\infty} \frac{x^2}{(x^2+a^2)(x^2+b^2)(x^2+c^2)} dx = \frac{\pi}{2(a+b)(b+c)(c+a)}$, the value of $\int_0^{\infty} \frac{dx}{(x^2+4)(x^2+9)}$

a) $\frac{\pi}{40}$

b) $\frac{\pi}{20}$

c) $\frac{\pi}{60}$

d) $\frac{\pi}{80}$

20. The area of the region bounded by the curves y = |x - 2|, x = 1, x = 3 and the x – axis is

a) 1

b) 4

c) 2

d) 3

21. The area of the region bounded by the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ is

a) $20\pi^2$ sq. units

b) 25π sq. units

c) 20π sq. units

d) $16\pi^2$ sq. units

22. What is the solution of the differential equation $\frac{ydx-xdy}{y^2} = 0$?

a) x + y = C

b) x - y = C

c) xy = C

d) y = Cx

23. The solution of the differential equation $\frac{dy}{dx} = \frac{y}{x} + \frac{\phi\left(\frac{y}{x}\right)}{\phi'\left(\frac{y}{x}\right)}$ is

a) $\phi\left(\frac{y}{x}\right) = ky$

b) $x\phi\left(\frac{y}{x}\right) = k$

c) $y\phi\left(\frac{y}{x}\right) = k$

d) $\phi\left(\frac{y}{x}\right) = kx$

24. The degree of the differential equation $\frac{d^2y}{dx^2} + 3\left(\frac{dy}{dx}\right)^2 = x^2 \log\left(\frac{d^2y}{dx^2}\right)$ is

a) 3

b) 2

c) 1

d) Not defined

25. A homogeneous equation of the form $\frac{dy}{dx} = h\left(\frac{x}{y}\right)$ can be solved by making the substitution

a) $y = vx$

b) $x = vy$

c) $v = yx$

d) $x = v$

26. If $\vec{a} = \left(2\hat{\imath} + 4\hat{\jmath} - \hat{k}\right)$ and $\vec{b} = \left(3\hat{\imath} - 2\hat{\jmath} + \lambda\hat{k}\right)$ be such that $\vec{a} \perp \vec{b}$ $then \lambda =$?

a) 3

b) -2

c) 2

d) -3

27. $\vec{a}+\vec{b}+\vec{c}=0$ such that $|\vec{a}| = 3$, $|\vec{b}| = 5$ and $|\vec{c}| = 7$. What is the angle between $\vec{a}$ and $\vec{b}$?

a) $\frac{\pi}{3}$

b) $\frac{\pi}{2}$

c) $\frac{\pi}{4}$

d) $\frac{\pi}{6}$

28. Find$\left|\vec{a}\times\vec{b}\right|$, if $\vec{a}=3\hat{\imath}+\hat{\jmath}+2\hat{k}$ and $\vec{b}=2\hat{\imath}-2\hat{\jmath}+4\hat{k}$

a) $8\sqrt{3}$

b) $19\sqrt{3}$

c) $19\sqrt{5}$

d) $17\sqrt{2}$

29. If the vertices A, B, C of a triangle ABC are (1, 2, 3), (–1, 0, 0), (0, 1, 2), respectively, then find$\angle ABC$. [$\angle ABC$ is the angle between the vectors $\overrightarrow{BA}$ and $\overrightarrow{BC}$

a) $\cos^{-1}\left(\frac{13}{\sqrt{102}}\right)$

b) $\cos^{-1}\left(\frac{11}{\sqrt{102}}\right)$

c) $\cos^{-1}\left(\frac{15}{\sqrt{102}}\right)$

d) $\cos^{-1}\left(\frac{10}{\sqrt{102}}\right)$

30. Let$\hat{a}$, $\hat{b}$ be two unit vectors and θ be the angle between them. What is cos $\left(\frac{\theta}{2}\right)$ equal to?

a) $\frac{|\hat{a}+\hat{b}|}{2}$

b) $\frac{|\hat{\mathbf{a}}-\hat{\mathbf{b}}|}{4}$

c) $\frac{|\hat{\mathbf{a}}-\hat{\mathbf{b}}|}{2}$

d) $\frac{|\hat{\mathbf{a}}+\hat{\mathbf{b}}|}{4}$

31. If the magnitudes of two vectors $\vec{a}$ and $\vec{b}$ are equal, then which one of the following is correct?

a) None of these

b) $(\vec{a} + \vec{b}) \times (\vec{a} - \vec{b}) = 1$

c) $(\vec{a} + \vec{b})$ is perpendicular to $(\vec{a} - \vec{b})$

d) $(\vec{a} + \vec{b})$ is parallel to $(\vec{a} - \vec{b})$

32. If a unit vector $\vec{a}$ makes angles $\frac{\pi}{3}$ $with\, \hat{\imath}$, $\frac{\pi}{4}$ $with\, \hat{\jmath}\, and\, an\, acute\, angle\, \theta\, with\, \hat{k}$, then the components of $\vec{a}$ are

a) $\frac{1}{2}, \frac{1}{\sqrt{2}}, \frac{1}{3}$

b) $\frac{1}{3}, \frac{1}{\sqrt{2}}, \frac{1}{2}$

c) $\frac{1}{3}, \frac{1}{\sqrt{3}}, \frac{1}{2}$

d) $\frac{1}{2}, \frac{1}{\sqrt{2}}, \frac{1}{2}$

33. If a line makes angles $\alpha, \beta, \gamma, \delta$ with four diagonals of a cube then $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\theta$ is equal to

a) $\frac{1}{3}$

b) $\frac{2}{3}$

c) $\frac{8}{3}$

d) $\frac{4}{3}$

34. Find the cartesian equation of the line that passes through the origin and (5, – 2, 3).

a) $\frac{x}{5} = \frac{y}{-2} = \frac{z}{3}$

b) $\frac{x}{6} = \frac{y}{-2} = \frac{z}{3}$

c) $\frac{x}{5} = \frac{y}{-1} = \frac{z}{3}$

d) $\frac{x}{5} = \frac{y}{-2} = \frac{z}{4}$

35. If a plane meets the coordinate axes in A, B and C such that the centroid of $\triangle$ ABC is (1, 2, 4), then the equation of the plane is

a) x + 2y + 4z = 7

b) 4x + 2y + z = 12

c) x + 2y + 4z = 6

d) 4x + 2y + z = 7

36. The equation of the plane $\vec{r} = \hat{\imath} - \hat{\jmath} + \lambda(\hat{\imath} + \hat{\jmath} + \hat{k}) + \mu(\hat{\imath} - 2\hat{\jmath} + 3\hat{k})$ in scalar product form is

a) $\vec{r} \cdot (5\hat{\imath} + 2\hat{\jmath} - 3\hat{k}) = 7$

b) $\vec{r} \cdot (5\hat{\imath} - 2\hat{\jmath} - 3\hat{k}) = 7$

c) None of these

d) $\vec{r} \cdot (5\hat{\imath} - 2\hat{\jmath} + 3\hat{k}) = 7$

37. The foot of the perpendicular from the point A(7, 14, 5) to the plane 2x + 4y - z = 2 is

a) (5, - 3, - 4)

b) (3, - 3, 5)

c) (3, 1, 8)

d) (1, 2, 8)

38. The equation of a plane passing through the points A(a, 0, 0), B(0, b, 0) and C(0, 0, c) is given by

a) $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$

b) $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 0$

c) ax + by + cz = 1

d) ax + by + cz = 0

39. The direction cosines of the perpendicular from the origin to the plane $\vec{r} \cdot (6\hat{\imath} - 3\hat{\jmath} + 2\hat{k}) + 1 = 0$ are

a) None of these

b) $\frac{6}{7}, \frac{3}{7}, \frac{-2}{7}$

c) $\frac{6}{7}, \frac{-3}{7}, \frac{2}{7}$

d) $\frac{-6}{7}, \frac{3}{7}, \frac{2}{7}$

40. The distance between the parallel planes 2x - 3y + 6z = 5 and 6x - 9y + 18z + 20 = 0, is

a) $\frac{8}{5}$ units

b) $8\sqrt{5}$ units

c) $5\sqrt{3}$ units

d) $\frac{5}{3}$ units

41. The objective function Z = 4 x + 3 y can be maximised subjected to the constraints 3x + 4y≤ 24, 8x + 6y ≤ 48 , x ≤ 5 , y ≤ 6 ; x, y ≥ 0

a) at only one point

b) None of these

c) at two points only

d) at an infinite number of points

42. Which of the following is a convex set?

a) $\{(x, y): y^2 \geq x\}$

b) $\{(x, y): x^2 + y^2 \geq 1\}$

c) $\{(x, y): x \geq 2, y \leq 4\}$

d) $\{x, y): 3x^2 + 4y^2 \geq 5\}$

43. Maximise the function $Z = 11x + 7y$, subject to the constraints: $x \leq 3$, $y \leq 2$, $x \geq 0$, $y \geq 0$.

a) 50

b) 48

c) 49

d) 47

44. Objective function of an LPP is

a) a function to be optimized

b) None of these

c) a constraint

d) a relation between the variables

45. A fair coin is tossed 100 times. The probability of getting tails an odd number of times is

a) $\frac{1}{8}$

b) None of these

c) $\frac{3}{8}$

d) $\frac{1}{2}$

Question No. 46 to 50 are based on the given text. Read the text carefully and answer the questions: A card is lost from a pack of 52 cards. From the remaining cards, two cards are drawn at random.

46. The probability of drawing two diamonds, given that a card of diamond is missing, is

a) $\frac{1}{425}$

b) $\frac{21}{425}$

c) $\frac{22}{425}$

d) $\frac{23}{425}$

47. The probability of drawing two diamonds, given that a card of the heart is missing, is

a) $\frac{26}{425}$

b) $\frac{22}{425}$

c) $\frac{23}{425}$

d) $\frac{19}{425}$

48. Let A be the event of drawing two diamonds from the remaining 51 cards and E_1 , E_2 , E_3, and E_4 be the events that lost card is of diamond, club, spade, and heart respectively, then the approximate value of $\sum_{i=1}^{4} P(A|E_i)$ is

a) 0.24

b) 0.18

c) 17

d) 0.25

49. The probability of the lost card being a diamond

a) $\frac{21}{50}$

b) $\frac{1}{51}$

c) $\frac{11}{52}$

d) $\frac{11}{50}$

50. All of a sudden, a missing card is found, and, then two cards are drawn simultaneously without replacement. The probability that both drawn cards are king is:

a) $\frac{64}{169}$

b) $\frac{12}{169}$

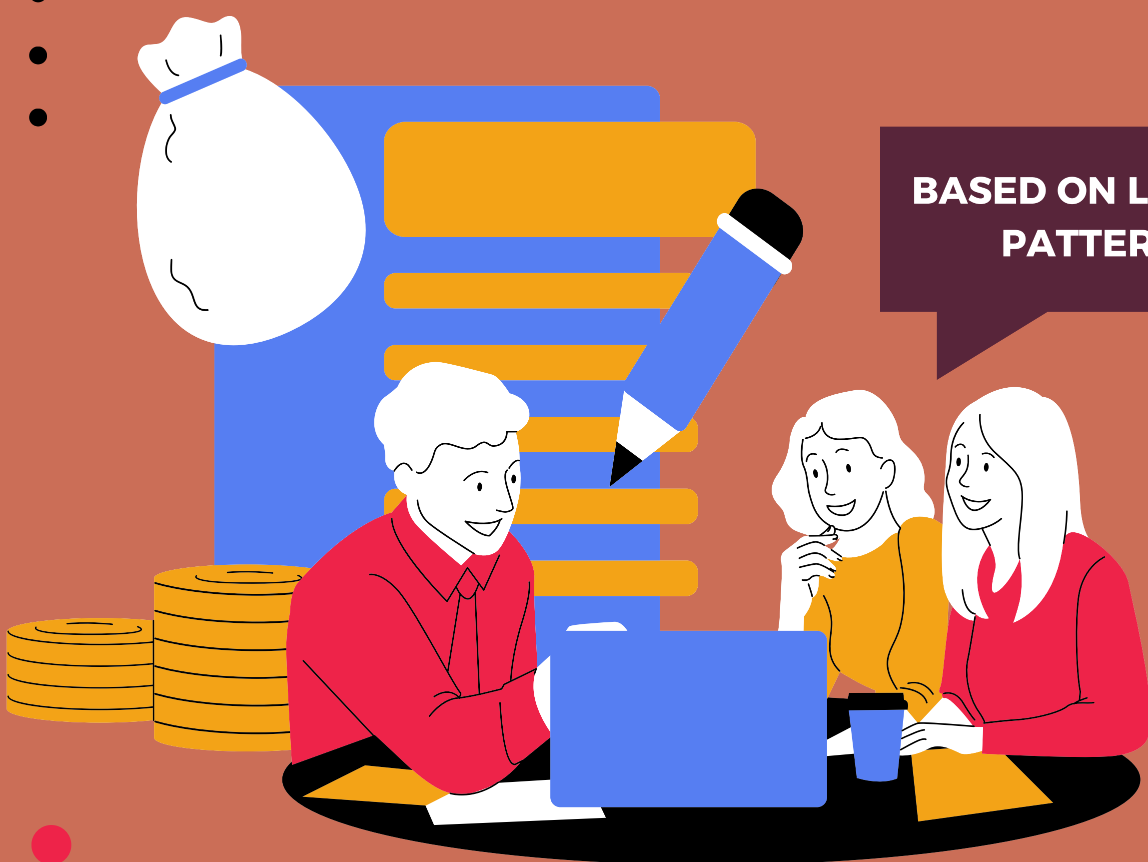
c) None of these

d) $\frac{1}{221}$

CUET 2024

MATHEMATICS

Sample Paper 4



BASED ON LATEST PATTERN

CUET PRATICE PAPER 04

1. Let S be the set of all straight lines in a plane. Let R be a relation on S defined by a$Rb \Leftrightarrow a \parallel b$. Them, R is
   a) reflexive and symmetric but not transitive
   b) symmetric and transitive but not reflexive
   c) an equivalence relation
   d) reflexive and transitive but not symmetric

2. If f (x) =$(25 - x^4)^{1/4}$ for 0 x $\sqrt{5}$, then $f\left(f\left(\frac{1}{2}\right)\right)$ =
   a) 2^{-4}
   b) 2^{-3}
   c) 2^{-1}
   d) 2^{-2}

3. The range of the function f(x) = cos ($\frac{x}{3}$) is
   a) [-1,1]
   b) $\left[-\frac{1}{3}, \frac{1}{3}\right]$
   c) [-3,3]
   d) None of these

4. Domain of $\cos^{-1}$ x is
   a) [-1,0]
   b) [0,1]
   c) None of these
   d) [-1,1]

5. The value of cot $(\sin^{-1} x)$ is

a) $\frac{\sqrt{1-x^2}}{x}$

b) $\frac{x}{\sqrt{1+x^2}}$

c) $\frac{1}{x}$

d) $\frac{\sqrt{1+x^2}}{x}$

6. $\cos^{-1}(\cos\frac{2\pi}{3}) + \sin^{-1}(\sin\frac{2\pi}{3}) = ?$

a) π

b) $\frac{\pi}{3}$

c) $\frac{3\pi}{4}$

d) $\frac{4\pi}{3}$

7. Domain of $\sec^{-1}$ x is

a) [-1,1]

b) R - (- 1, 1)

c) R - {0}

d) R - [- 1, 0]

8. If A $=\begin{bmatrix} n & 0 & 0 \\ 0 & n & 0 \\ 0 & 0 & n \end{bmatrix}$ and B $=\begin{bmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{bmatrix}$,then AB is equal to

a) B^n

b) A+B

c) nB

d) B

CLICK HERE FOR SOLUTIONS

9. If A = $\begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$,then A ^{n} (where n ∈ N) equals

a) $\begin{bmatrix} 1 & na \\ 0 & 0 \end{bmatrix}$

b) $\begin{bmatrix} 1 & na \\ 0 & 1 \end{bmatrix}$

c) $\begin{bmatrix} 1 & n^2a \\ 0 & 1 \end{bmatrix}$

d) $\begin{bmatrix} n & na \\ 0 & n \end{bmatrix}$

10. If A is a square matrix, then A – A’ is a

a) Symmetric matrix

b) None of these

c) Skew-symmetric matrix

d) Diagonal matrix

11. $\begin{vmatrix} \sin 23° & -\sin 67° \\ \cos 23° & \cos 67° \end{vmatrix}$ = ?

a) $\frac{\sqrt{3}}{2}$

b) sin 16^o

c) 1

d) cos 16^o

12. If A is a square matrix such that A^2 = A, then, det.(A) = ______

a) 2 or -2

b) None of these

c) 1 or -1

d) 0 or 1

13. If $\begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix} \begin{bmatrix} 1 & \tan\theta \\ -\tan\theta & 1 \end{bmatrix}^{-1} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$, then

a) None of these

b) a = cos 2θ ,b = sin 2 θ

c) a = 1, b = 1

d) a = sin 2θ , b = cos 2 θ

14. The value of det A where A=$\begin{bmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{bmatrix}$ lies in the interval

a) [0,2]

b) None of these

c) [2,4]

d) [1,2]

15. If $S = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then adj A is

a) $\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

b) $\begin{bmatrix} -d & -b \\ -c & a \end{bmatrix}$

c) $\begin{bmatrix} d & c \\ b & a \end{bmatrix}$

d) $\begin{bmatrix} d & b \\ c & a \end{bmatrix}$

16. The function f(x) = |cos x| is

a) everywhere continuous but not differentiable at $(2n + 1)\frac{\pi}{2}$, n ∈ Z

b) everywhere continuous and differentiable

c) neither continuous nor differentiable at $(2n + 1)\frac{\pi}{2}$, n ∈ Z

d) none of these

17. If y = $\tan^{-1}\left(\frac{a\cos x - b\sin x}{b\cos x + a\sin x}\right)$ then $\frac{dy}{dx} = ?$

a) $\frac{a}{b}$

b) 1

c) -1

d) $\frac{-b}{a}$

18. If f (x) = x $\tan^{-1}$ x then f ‘ (1) is equal to

a) None of these

b) $\frac{1}{2} - \frac{\pi}{4}$

c) $\frac{\pi}{4} - \frac{1}{2}$

d) $\frac{\pi}{4} + \frac{1}{2}$

19. The tangent to the curve given by x = $e^t \times \cos t$, y = $e^t \times \sin t$ at t = $\frac{\pi}{4}$ makes with x - axis an angle:

a) 0

b) $\frac{\pi}{4}$

c) $\frac{\pi}{3}$

d) $\frac{\pi}{2}$

20. The minimum value of f(x) = $3x^4 - 8x^3 - 48x + 25$ on [0, 3] is

a) 25

b) 16

c) -39

d) None of these

21. The function f(x) = $4\sin^3 x - 6\sin^2 x + 12\sin x + 100$ is strictly

a) increasing in $\left(\pi, \frac{3\pi}{2}\right)$

b) decreasing in $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$

c) decreasing in $\left(\frac{\pi}{2}, \pi\right)$

d) decreasing in $\left[0, \frac{\pi}{2}\right]$

22. $\int \frac{dx}{\sqrt{x^2-16}}$ =?

a) $\log\left|x + \sqrt{x^2 - 16}\right| + C$

b) None of these

c) $\log\left|x - \sqrt{x^2 - 16}\right| + C$

d) $\sin^{-1}\left(\frac{x}{4}\right) + C$

23. $\int \frac{1}{e^x+1} dx$ is equal to

a) $\log(1 + e^{-2x}) + C$

b) $\log(e^{-2x} - 2x) + C$

c) $-\log(1 + e^{-x}) + C$

d) $\log(e^{3x} + x) + C$

24. $\int_0^{\frac{\pi}{2}} \frac{\tan x}{(1+\tan x)} dx = ?$

a) $\frac{\pi}{4}$

b) 0

c) 1

d) π

25. $\int \frac{1}{(1+\cos x)} dx$ =?

a) cot x + cosec x + C

b) - cot x + cosec x + C

c) cot x - cosec x + C

d) none of these

26. $\int \frac{\sin^2 x}{(1+\cos x)} dx$ = ?

a) x + sin x+ C

b) x - sin x+ C

c) - sin x - x + C

d) sin x - x + C

27. $\int \frac{dx}{(4\sin^2 x+5\cos^2 x)}$ =?

a) $\frac{1}{2\sqrt{5}} \tan^{-1}\left(\frac{2\tan x}{\sqrt{5}}\right) + C$

b) $\frac{1}{\sqrt{5}} \tan^{-1}\left(\frac{\tan x}{\sqrt{5}}\right) + C$

c) $\frac{1}{2} \tan^{-1}\left(\frac{\tan x}{\sqrt{5}}\right) + C$

d) None of these

28. Area lying between the curves $y^2 = 4x$ and $y = 2x$ is

a) $\frac{2}{3}$

b) $\frac{3}{4}$

c) $\frac{1}{4}$

d) $\frac{1}{3}$

29. The area included between the parabolas $y^2 = 4x$ and $x^2 = 4y$ is (in square units).

a) $\frac{16}{3}$

b) $\frac{4}{3}$

c) $\frac{1}{3}$

d) $\frac{8}{3}$

30. The area bounded by the parabola $x = 4 - y^2$ and y - axis, in square units, is

a) $\frac{33}{2}$

b) $\frac{3}{32}$

c) $\frac{32}{3}$

d) $\frac{16}{3}$

31. The area bounded by $y = 2 - x^2$ and $x + y = 0$ is

a) $\frac{9}{2}$ sq. units

b) $\frac{7}{2}$ sq. units

c) None of these

d) 9 sq. units

32. The number of arbitrary constants in the particular solution of a differential equation of third order are:

a) 1

b) 3

c) 2

d) 0

33. What is the degree of the differential equation $y = x\frac{dy}{dx} + \left(\frac{dy}{dx}\right)^{-1}$?

a) -1

b) 1

c) Does not exist

d) 2

34. The degree of the differential equation $\left[1+\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}} = \frac{d^2y}{dx^2}$ is

a) 2

b) $\frac{3}{2}$

c) Not defined

d) 4

35. The order of the differential equation of all circles of given radius a is:

a) 4

b) 1

c) 2

d) 3

36. The angle between the vectors $\vec{a} = \hat{\imath} - 2\hat{\jmath} + 3\hat{k}$ *and* $\vec{b} = 3\hat{\imath} - 2\hat{\jmath} + \hat{k}$ *is*

a) $\cos^{-1}\frac{3}{5}$

b) None of these

c) $\cos^{-1}\frac{5}{7}$

d) $\frac{3}{\sqrt{14}}$

37. If $|\vec{a}| = 3$ and $-1 \le k \le 2$, then $|k\vec{a}|$ lies in the interval.

a) [-3,6]

b) [3,6]

c) [0,6]

d) [1,2]

38. If $|\vec{a}| = \sqrt{2}$, $|\vec{b}| = \sqrt{3}$ and |a+ b| = $\sqrt{6}$, then what is $|\vec{a} + \vec{b}|$ equal to?

a) 2

b) 4

c) 3

d) 1

39. Consider the vectors $\vec{a} = \hat{\imath} - 2\hat{\jmath} + \hat{k}$ and b = $4\hat{\imath} - 4\hat{\jmath} + 7\hat{k}$. What is the scalar projection of $\vec{a}$ on $\vec{b}$?

a) $\frac{23}{9}$

b) $\frac{17}{9}$

c) 1

d) $\frac{19}{9}$

40. In an LPP, if the objective function z = ax + by has the same maximum value on two corner points of the feasible region, then the number of points at which z_{max} occurs is:

a) Finite

b) 0

c) Infinite

d) 2

41. Maximize Z = 3x + 4y, subject to the constraints : $x + y \leq 1$, $x \geq 0$, $y \geq 0$.

a) 4

b) 5

c) 6

d) 3

42. A coin is tossed 5 times. What is the probability that head appears an even number of times?

a) $\frac{4}{15}$

b) $\frac{3}{5}$

c) $\frac{2}{5}$

d) $\frac{1}{2}$

43. A biased coin with probability p, 0 p , of heads is tossed until a head appears for the first time. If the probability that the number of tosses required is even is 2/5,then p equals

   a) $\frac{2}{3}$
   b) $\frac{2}{5}$
   c) $\frac{1}{3}$
   d) $\frac{3}{5}$

44. The probability of having at least one tail in five throws with a coin is

   a) $\frac{1}{5}$
   b) $\frac{1}{32}$
   c) $\frac{31}{32}$
   d) 1

45. One hundred identical coins, each with probability p of showing heads are tossed once. If 0 p and the probability of heads showing on 50 coins is equal to that of heads showing on 51 coins, the value of p is

   a) $\frac{49}{101}$
   b) $\frac{51}{101}$
   c) None of these
   d) $\frac{1}{2}$

Question No. 46 to 50 are based on the given text. Read the text carefully and answer the questions: Suppose the floor of a hotel is made up of mirror polished Kota stone. Also, there is a large crystal chandelier attached at the ceiling of the hotel. Consider the floor of the hotel as a plane having equation x - 2y + 2z - 3 and crystal chandelier at the point (3, - 2, 1).

46. The dir.'s of the perpendicular from the point (3, - 2, 1) to the plane x - 2y + 2z = 3, is
    a) 1,1,2
    b) 1,-2,2
    c) 1,-1,2
    d) 1,2,2

47. The length of the perpendicular from the point (3, - 2 , 1) to the plane x - 2y + 2z = 3, is
    a) $\frac{2}{3}$ units
    b) 2 units
    c) 3 units
    d) None of these

48. The equation of the perpendicular from the point (3, - 2, 1) to the plane x - 2y + 2z = 3, is
    a) $\frac{x-3}{1} = \frac{y-2}{-2} = \frac{z-1}{2}$
    b) $\frac{x-3}{1} = \frac{y+2}{-2} = \frac{z-1}{2}$
    c) $\frac{x+3}{1} = \frac{y+2}{-2} = \frac{z-1}{2}$
    d) None of these

49. The equation of plane parallel to the plane x - 2y + 2z = 3, which is at a unit distance from the point (3, - 2, 1) is

a) x - 2y + 2z = 12

b) Both x - 2y + 2z = 6 and x - 2y + 2z = 12

c) x - 2y + 2z = 0

d) x - 2y + 2z = 6

50. The image of the point (3, - 2, 1) in the given plane is

a) $\left(\frac{-5}{3}, \frac{2}{3}, \frac{5}{3}\right)$

b) $\left(\frac{-5}{3}, \frac{-2}{3}, \frac{5}{3}\right)$

c) $\left(\frac{5}{3}, \frac{2}{3}, \frac{-5}{3}\right)$

d) None of these

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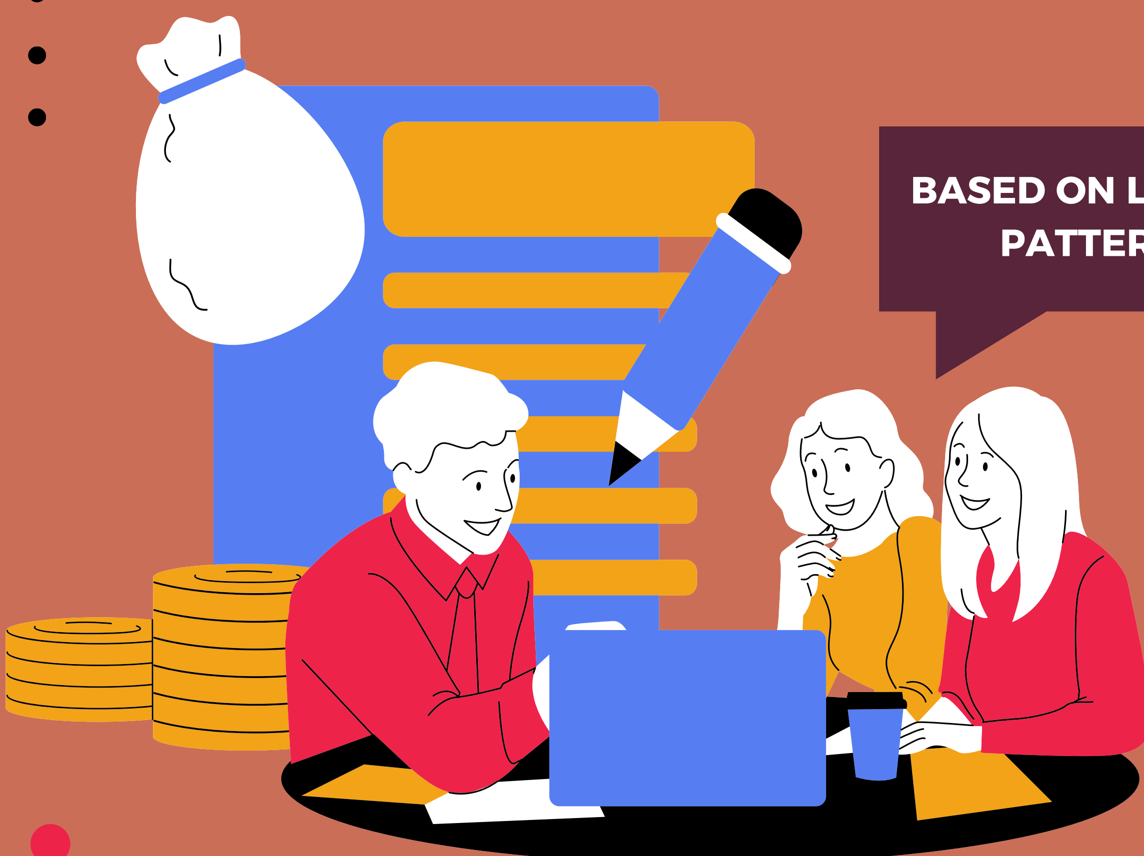

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CUET PRATICE PAPER 05

1. Let R be the real line. Consider the following subsets of the plane $R \times R$

   $S = \{(x, y): y = x + 1 \text{ and } o < x < 2\}$

   $T = \{(x, y): x - y \text{ is an integer}\}$

   Which of the following is true?

   a) T is an equivalent relation on R but S is not

   b) Neither S nor T is an equivalence relation on R

   c) Both S and T are equivalence relations on R

   d) S is an equivalence relations on R and T is not

2. If $f(x) = \frac{x}{x-1}, x \neq 1$ then

   $\underbrace{(f^o f^{o \cdots o} f)(x)}_{19 \text{ times}}$ is equal to

   a) $\frac{x}{x-1}$

   b) $\left(\frac{x}{x-1}\right)^{19}$

   c) $\frac{19x}{x-1}$

   d) x

3. The domain of definition of $f(x) = \sqrt{\log_{10}(\log_{10} x) - \log_{10}(4 - \log_{10} x) - \log_{10} 3,}$ is

   a) $(10^3, 10^4)$

   b) $[10^3, 10^4]$

   c) $[10^3, 10^4)$

   d) $(10^3, 10^4]$

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4. If $a_1, a_2, a_3, \dots, a_n$ are in AP with common ratio d, then $\tan\left[\tan^{-1} \frac{d}{1+a\_1a_2} + \tan^{-1} \frac{d}{1+a_2a_3} + \dots + \tan^{-1} \frac{4}{1+a_{n-1}a_n}\right]$ is equal to

   a) $\frac{(n-1)d}{a_1+a_n}$

   b) $\frac{(n-1)d}{1+a_1a_n}$

   c) $\frac{nd}{1+a_1a_n}$

   d) $\frac{a_n-a_1}{a_n+a_1}$

5. If $e^{[\sin^2\alpha+\sin^4\alpha+\sin^6\alpha+\dots\infty]\log_e 2}$ is a root of equation $x^2-9x+8=0$,where $0<\alpha<\frac{\pi}{2}$, then the principle value of $\sin^{-1}\sin\left(\frac{2\pi}{3}\right)$ is

   a) α

   b) 2α

   c) $-\alpha$

   d) -2α

6. The sum of series

   $\tan^{-1}\frac{1}{1+1+1^2} + \tan^{-1}\frac{1}{1+2+2^2} + \tan^{-1}\frac{1}{1+3+3^2} + \quad \dots \infty$ is equal to

   a) $\frac{\pi}{4}$

   b) $\frac{\pi}{2}$

   c) $\frac{\pi}{3}$

   d) $\frac{\pi}{6}$

7. The value of $\begin{vmatrix} 1990 & 1991 & 1992 \\ 1991 & 1992 & 1993 \\ 1992 & 1993 & 1994 \end{vmatrix}$ is

   a) 1992

   b) 1993

   c) 1994

   d) 0

8. Let a, b, c be positive real numbers. The following system of equations in x, y and z $\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=1, \frac{x^2}{a^2}-\frac{y^2}{b^2}+\frac{z^2}{c^2}=1, -\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ has

   a) No solution

   b) Unique solution

   c) Infinitely many solutions

   d) Finitely many solutions

9. The sum of the products of the elements of any row of a determinant A with the cofactors of the corresponding elements is equal to

   a) 1

   b) 0

   c) $|A|$

   d) $\frac{1}{2}|A|$

10. A is a scalar matrix with $k \neq 0$ of order 3. Then A^{-1} is

   a) $\frac{1}{k^2}I$

   b) $\frac{1}{k^3}I$

   c) $\frac{1}{k}I$

   d) kI

11. If the system of equations $x+2y-3z=1, (p+2)z=3, (2p+1)y+z=2$ is consistent, then the value of p is

   a) -2

   b) -1/2

   c) 0

   d) 2

12. If $A = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$, I is the unit matrix of order 2 and a, b are arbitrary constants, then $(aI + bA)^2$ is equal to

a) $a^2I - abA$

b) $a^2I + 2abA$

c) $a^2I + b^2A$

d) None of the above

13. If $f(x) = |\log_e x|$, then

a) $f'(1^+) = 1, f'(1^-) = -1$

b) $f'(1^-) = -1, f'(1^+) = 0$

c) $f'(1) = 1, f'(1^-) = 0$

d) $f'(1) = -1, f'(1^+) = -1$

14. Let $f(x)$ be an odd function. Then $f'(x)$

a) Is an even function

b) Is an odd function

c) May be even or odd

d) None of these

15. Let $f(x) = [x]$ and $g(x) = \begin{cases} 0, & x \in Z \\ x^2, & x \in R - Z \end{cases}$ Then, which one of the following is incorrect?

a) $\lim_{x \to 1} g(x)$ exists, but $g(x)$ is not continuous at $x = 1$

b) $\lim_{x \to 1} f(x)$ does not exist and $f(x)$ is not continuous at $x = 1$

c) gof is continuous for all x

d) fog is continuous for all x

16. If y= $\sqrt{\log x + \sqrt{\log x + \sqrt{\log x + \sqrt{\log x + \cdots \infty}}}}$,

then $\frac{dy}{dx}$ is equal to

a) $\frac{x}{2y-1}$

b) $\frac{x}{2y+1}$

c) $\frac{1}{x(2y-1)}$

d) $\frac{1}{x(1-2y)}$

17. The derivative of $\left[\frac{e^x+1}{e^x}\right]$ is equal to

a) 0

b) $\frac{1}{e^x}$

c) $-\frac{1}{e^x}$

d) e^x

18. If the sum of the squares of the intercepts on the axes cut off by the tangent to the curve $x^{1/3} + y^{1/3} = a^{1/3}$ (with $a > 0$) at $P(a/8, a/8)$ is 2, then $a =$

a) 1

b) 2

c) 4

d) 8

19. If the rate of change of area of a square plate is equal to that of the rate of change of its perimeter, then length of the side is

a) 1 unit

b) 2 units

c) 3 units

d) 4 units

20. The maximum value $x^3 - 3x$ in the interval [0, 2] is

a) -2

b) 0

c) 2

d) 1

21. $\int_{\pi/6}^{\pi/3} \frac{1}{1+\sqrt{cotx}} dx$ is

a) $\frac{\pi}{3}$

b) $\frac{\pi}{6}$

c) $\frac{\pi}{12}$

d) $\frac{\pi}{2}$

22. The value of $\int_0^{\pi/2} cosx e^{sinx} dx$ is

a) 1

b) e-1

c) 0

d) -1

23. If $\int_0^1 f(x)dx = 1, \int_0^1 xf(x)dx = a , \int_0^1 x^2 f(x)dx = a^2$, then $\int_0^1 (a-x)^2\, dx$ equals

a) $4a^2$

b) 0

c) $2a^2$

d) None of these

24. The value of $\int_0^1 \tan^{-1}\left(\frac{2x-1}{1+x-x^2}\right) dx$, is

a) 1

b) 0

c) -1

d) $\frac{\pi}{4}$

25. $\int_{a+c}^{b+c} f(x)dx$ is equal to

a) $\int_{a}^{b} f(x-c)dx$

b) $\int_{a}^{b} f(x+c)dx$

c) $\int_{a}^{b} f(x)dx$

d) $\int_{a-c}^{b-c} f(x)dx$

26. $\int |x|^3\, dx$ is equal to

a) $\frac{-x^4}{4} + C$

b) $\frac{|x|^4}{4} + C$

c) $\frac{x^4}{4} + C$

d) None of these

27. $\int e^x \left[\frac{1-sinx}{1-cosx}\right] dx =$

a) $-e^x tan\frac{x}{2} + C$

b) $-e^x cot\frac{x}{2} + C$

c) $-\frac{1}{2} e^x tan\frac{x}{2} + C$

d) $-\frac{1}{2} e^x cot\frac{x}{2} + C$

28. $\int \frac{e^x(1+x)}{cos^2(xe^x)} dx =$

a) $2\log_e \cos(xe^x) + C$

b) $\sec(xe^x) + C$

c) $\tan(xe^x) + C$

d) $\tan(x + e^x) + C$

29. $\int \tan^{-1}\sqrt{x}\, dx$ is equal to

a) $(x+1)\tan^{-1}\sqrt{x} - \sqrt{x} + C$

b) $x\tan^{-1}\sqrt{x} - \sqrt{x} + C$

c) $\sqrt{x} - x\tan^{-1}\sqrt{x} + C$

d) $\sqrt{x} - (x+1)\tan^{-1}\sqrt{x} + C$

30. $\int \frac{dx}{x(x^7+1)}$ is equal to

a) $\log\left(\frac{x^7}{x^7+1}\right) + c$

b) $\frac{1}{7}\log\left(\frac{x^7}{x^7+1}\right) + c$

c) $\log\left(\frac{x^7+1}{x^7}\right) + c$

d) $\log\left(\frac{x^7+1}{x^7}\right) + c$

31. If A_n be the area bounded by the curve $y = (\tan x)^n$ and the lines $x = 0, y = 0$ and $x = \pi/4$, then for $x > 2$

a) $A_n + A_{n-2} = \frac{1}{n-1}$

b) $A_n + A_{n-2} < \frac{1}{n-1}$

c) $A_n - A_{n-2} = \frac{1}{n-1}$

d) None of these

32. Ratio of the area cut off a parabola by any double ordinate is that corresponding rectangle contained by that double ordinate and its distance from the vertex is

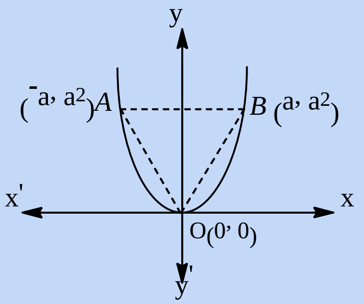
a) 1/2

b) 1/3

c) 2/3

d) 1

33. The figure shows a ΔAOB and the parabola $y = x^2$. The ratio of the area of the ΔAOB to the area of the region AOB of the parabola $y = x^2$ is equal to



a) $\frac{3}{5}$

b) $\frac{3}{4}$

c) $\frac{7}{8}$

d) $\frac{5}{6}$

34. A parallelogram is constructed on the vectors $\vec{a} = 3\vec{p} - \vec{q}$, $\overrightarrow{b} = \vec{p} + 3\vec{q}$ and also given that $|\vec{p}| = |\vec{q}| = 2$. If the vectors $\vec{p}$ and $\vec{q}$ are inclined at an angle $\pi/3$, then the ratio of the lengths of the diagonals of the parallelogram is

a) $\sqrt{6}:\sqrt{2}$

b) $\sqrt{3}:\sqrt{5}$

c) $\sqrt{7}:\sqrt{3}$

d) $\sqrt{6}:\sqrt{5}$

35. Two adjacent sides of a parallelogram $ABCD$ are given by $\overrightarrow{\mathbf{AB}} = 2\hat{\mathbf{i}} + 10\hat{\mathbf{j}} + 11\hat{\mathbf{k}}$ and $\overrightarrow{AD} = -\hat{\mathbf{i}} + 2\hat{\mathbf{j}} + 2\hat{\mathbf{k}}$. The side AD is rotated by an acute angle α in the plane of the parallelogram so that AD becomes AD'. If AD' makes a right angle with the side AB, then the cosine of the angle α is given by

a) $\frac{8}{9}$

b) $\frac{\sqrt{17}}{9}$

c) $\frac{1}{9}$

d) $\frac{4\sqrt{5}}{9}$

36. Three vectors $\vec{a}, \vec{b}, \vec{c}$ are such that $\vec{a} \times \vec{b} = 2\vec{a} \times \vec{c}, |\vec{a}| = |\vec{c}| = 1$ and $|\vec{b}| = 4$. If the angle between $\vec{b}$ and $\vec{c}$ is $\cos^{-1}\left(\frac{1}{4}\right)$, then $\vec{b} - 2\vec{c}$ is equal to

a) $\pm 4\vec{a}$

b) $\pm 3\vec{a}$

c) $\pm 5\vec{a}$

d) $\pm 4\vec{a}$

37. Let $\vec{\mathbf{a}}, \vec{\mathbf{b}}$ and $\vec{\mathbf{c}}$ be non-zero vectors such that $(\vec{\mathbf{a}} \times \vec{\mathbf{b}}) \times \vec{\mathbf{c}} = -\frac{1}{4}|\vec{\mathbf{b}}||\vec{\mathbf{c}}|\vec{\mathbf{a}}$. If θ is the acute angle between vectors $\vec{\mathbf{b}}$ and $\vec{\mathbf{c}}$, then the angle between $\vec{\mathbf{a}}$ and $\vec{\mathbf{c}}$ is equal to

a) $\frac{2\pi}{3}$

b) $\frac{\pi}{4}$

c) $\frac{\pi}{3}$

d) $\frac{\pi}{2}$

38. The equation of the plane passing through the point (1, 1, 1) and containing the line of intersection of the planes $x + y + z = 6$ and $2x + 3y + 4z = 12$ is

a) $x + y + z = 3$

b) $x + 2y + 3z = 6$

c) $2x + 3y + 4z = 9$

d) $3x + 4y + 5z = 18$

39. If $P(x, y, z)$ is a point on the line segment joining $Q(2,24)$ and $R(3,5,6)$ such that the projections of OP on the axes are $\frac{13}{5}, \frac{19}{5}$ and $\frac{26}{5}$ respectively, then P divides QR in the ratio

a) 1:2

b) 3:2

c) 2:3

d) 1:3

40. There is point $P(a,a,a)$ on the line passing through the origin and equally inclined with axes. The equation of plane perpendicular to OP and passing through P cuts the intercepts on axes. The sum of whose reciprocals is

a) a

b) $\frac{3}{2a}$

c) $\frac{3a}{2}$

d) $\frac{1}{a}$

41. Which of the following is not a convex set?

a) $\{(x,y): 2x + 5y < 7$

b) $\{(x,y): x^2 + y^2 \leq 4\}$

c) $\{x: |x| = 5\}$

d) $\{(x,y): 3x^2 + 2y^2 \leq 6\}$

42. Corner points of the feasible region for an LPP are: (0,2),(3,0),(6,0),(6,8) and (0,5). Let z=4x+6y the objective function. The minimum value of z occurs at

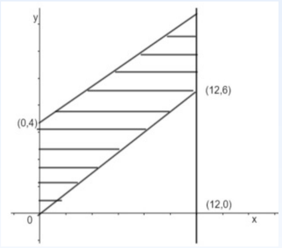
a) (0,2) only

b) (3,0) only

c) the mid-point of the line segment joining the points (0,2) and (3,0) only

d) any point on the line segment joining the points (0,2) and (3,0)

43. The feasible region for an LPP is shown in Figure. Let z=3x-4y be the objective function. Maximum value of z is



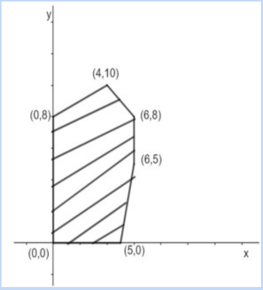
a) 0

b) 8

c) 12

d) -18

44. The feasible region of a LPP is shown in Figure. Let z=3x-4y be the objective function. Minimum of z occurs at



a) (0,0)
b) (0,8)
c) (5,0)
d) (4,10)

45. Among 15 players, 8 are batsman and 7 are bowlers. The probability that a team is chosen of 6 batsman and 5 bowlers, is

a) $\frac{{}^{8}C_{6}\times{}^{7}C_{5}}{{}^{15}C_{11}}$
b) $\frac{{}^{8}C_{6}+{}^{7}C_{5}}{{}^{15}C_{11}}$
c) $\frac{15}{28}$
d) None of these

46. In a series of three trials the probability of exactly two successes in nine times as large as the probability of three successes. Then, the probability of success in each trial is

a) 1/2
b) 1/3
c) 1/4
d) 3/4

47. There are 5 duplicate and 10 original items in an automobile shop and 3 items are brought at random by a customer. The probability that none of the items is duplicate, is

a) 20/91

b) 22/91

c) 24/91

d) 89/91

48. A, B, C are any three events. If $P(S)$ denotes the probability of S happening, then $P(A \cap (B \cup C)) =$

a) $P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C)$

b) $P(A) + P(B) + P(C) - P(B)P(C)$

c) $P(A \cap B) + P(A \cap C) - P(A \cap B \cap C)$

d) $P(A) + P(B) + P(C)$

49. Among the workers in a factory only 30% receive bonus and among those receiving bonus only 20% are skilled. The probability that a randomly selected worker is skilled and is receiving bonus is

a) 0.03

b) 0.02

c) 0.06

d) 0.015

50. The probability distribution of a random variable X is given as

$\boldsymbol{X}$	-5	-4	-3	-2	-1	0	1	2	3	4	5
$\boldsymbol{P(X)}$	p	$2p$	$3p$	$4p$	$5p$	$7p$	$8p$	$9p$	$10p$	$11p$	$12p$

Then, the value of P is

a) $\frac{1}{72}$

b) $\frac{3}{73}$

c) $\frac{5}{72}$

d) $\frac{1}{74}$

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